



UNIVERSITY OF TRENTO - Italy



UNIVERSITÀ
DEGLI STUDI
FIRENZE

Doctoral School of Social Sciences

Doctoral programme in Development Economics and Local Systems

Curriculum in Local Systems

Impact of Internationalization on the Cognitive Configuration of
Industrial Districts. Learning, Forgetting, and Unlearning Effects.

a dissertation submitted in partial fulfillment of the requirements for the Doctoral
degree (Ph.D.) doctoral programme in Development Economics and Local Systems

Claudia
Vecciolini
2017/2018

Supervisor – Prof. Marco Bellandi

Abstract

The increasing internationalization of Industrial Districts (IDs) is affecting the system's production organization and the institutional context surrounding it, raising concerns about the role of localized industries for the development of local societies. To explore the impact of international openness on IDs, we focus on the endogenous cognitive processes occurring within the local system and resulting from the absorption and transformation of internal and external knowledge inputs. Using a conceptual and empirical approach, we contribute to enhance the current understanding of the issue by analyzing the transformations of IDs in terms of the variations on the stock of knowledge embedded into the system, namely the stock of systemic knowledge.

In the First Chapter, we develop a conceptual frame to describe the endogenous cognitive processes determined by internationalization. We define three types of processes affecting systemic knowledge: “learning”, contributing to the increase of systemic knowledge; “forgetting”, determining the decrease of systemic knowledge; and “unlearning”, corresponding to the case in which the changes of the ID knowledge endowment lead to both learning and forgetting processes. In the Second Chapter, we apply the conceptual frame to a quantitative analysis referred to a dataset of Italian industrial firms between 2008 and 2015. The aim of the analysis is to measure how the type of internationalization undertaken by the mass of firms in the region, affects the innovation strategies of the ID firms located in the same territory. Based on the distinction between knowledge-seeking and knowledge-exploiting internationalization strategies, the analysis confirms that internationalization affects the innovation strategies of ID firms in different ways. We expect this is because, by modifying the system's endowment of knowledge, internationalization can either support or constrain the emergence of external economies of learning, affecting local innovation. Chapter Three presents another application of the conceptual frame based on the case study of the Macerata-Fermo footwear IDs. The analysis has the purpose to explore the endogenous cognitive processes triggered by international openness, and to disentangle the potential development paths that the systems are undertaking. In so doing, we also consider the contextual factors affecting the system's development path, such as the institutional background. In addition to informing us about the learning, forgetting and unlearning effects in the Macerata-Fermo IDs, the findings highlight that the degree of industrial diversification within the system is key to define its development path, favoring unlearning processes towards other industries in response to structural shocks.

Keywords: Learning, Forgetting, Unlearning Effects; District Absorptive Capacity; District Internationalization; Knowledge-Seeking Internationalization; Knowledge-Exploiting Internationalization

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Introduction

In a recent publication, Belussi and De Propris (2015) made it clear “They are Industrial Districts, but not as we know them!”. Unambiguous as it is, the statement presents the starting point for this research on the transformations to the roots of local development: industrial districts (IDs) are evolving, and sometimes into directions that set them apart from the characteristics of the original model described by Becattini (1990).

For nearly two decades starting from the mid-Seventies, the ID has drawn the attention of scholars and policy-makers focusing on the models of development based on localized industries. In these models, the productivity advantages are not limited to the internal economies of scale of the big, vertically integrated firm, as it is argued in the mass production model. The productivity advantages of the ID, usually referred to as district external economies, emerge from a system of closely connected firms specialized in related business fields within the same supply chain, and embedded into an institutional frame that acts as the organizational architecture of the ID. Therefore, two fundamental sub-systems enable the emergence of district external economies and their reproducibility over time: the industrial configuration, largely composed of small and medium-sized enterprises specialized in traditional manufacturing sectors, and the institutional frame corresponding to the set of market and non-market rules governing the interactions within the local society. In the last two decades, the evolution of communication technologies and the reduced transfer costs have favored the establishment of connections between people, firms and institutions from distant territories, questioning the role of the territorial dimension as a source of economic advantages for localized industries. The wave of criticism on the ID model is based on the idea that the ID structural features described above, that is the specific type of industrial configuration and its interweaving with the institutional context, unfit for the characteristics of today’s global competition. A primary challenge for the ID “communitarian market” (Dei Ottati, 2003), corresponding to the set of business relations governed by the norms and conventions transmitted through the local society, derives from the necessity to confront itself with production models being more and more unraveled into global value chains (GVCs).

The expansion of GVCs has come with the increasing fragmentation of the production process into separate tasks that can be realized by firms located in different places, either in the home country or abroad (Agostino et al., 2015). A plethora of empirical research on

IDs has documented the internationalization of supply chains starting from the Nineties, when firms began to outsource abroad the most labor-intensive production activities to increase efficiency (Amighini and Rabellotti, 2006; Sammarra and Belussi, 2006). The international expansion of supply relationships has contributed to increase the heterogeneity within the ID, marking a boundary between those firms that have seized the opportunities of internationalization, and the other firms that have remained stuck in old business models and are now lagging behind. While the first ones have increased their size and performance, and improved their organizational capabilities to coordinate a global network of commercial, productive, and other knowledge-intensive relations, the others have suffered the most from the consequences of globalization and in many cases, have been forced to shut down (Giuliani and Rabellotti, forthcoming; De Marchi et al., forthcoming). By undermining the industrial configuration and the set of relationships embedded into the socio-cultural environment of the ID, the international division of labor may downplay the “local determinants of competitiveness” and weaken the emergence of district external economies (Bellandi and De Propriis, 2015), representing one of the factors that are leading to the decline of some IDs (De Marchi and Grandinetti, 2014).

On the other hand, the involvement of IDs into GVCs is key to access an array of resources that would not be available in self-contained market systems, fostering upgrading processes inside the ID, that is, the shift to products and tasks characterized by higher value added (Giuliani et al., 2005). As affirmed by Belussi and De Propriis (2013) and Chiarvesio et al. (2010), international openness contributes to increase the ID capacity of adaptation to a changing market environment, as it supports the improvement of those competencies related to the coordination of international networks (e.g. management of complex business models, supervision of marketing and distribution channels), and it prompts the diffusion of open models of learning and innovation enabling local actors to tap into trans-local circuits of knowledge inputs.

The transformations of IDs determined by globalization are giving rise to diverse trajectories of development among these systems. Empirical research on the evolution of IDs has described how internationalization may have determined the decline of local business networks (Boschma and Ter Val, 2007), or conversely, it may have triggered the upgrading of product quality, the diffusion of more advanced business models and the shift towards related sectoral specializations (Rabellotti et al., 2009). Although the trajectories of development have been largely discussed and confronted on the basis of the existing empirical evidence, we still observe a void in the literature, corresponding to the actual

conditions that lead an ID to the attainment of a specific development path. A similar question has raised the attention of scholars focusing on other types of localized industries, such as clusters. Drawing on the cluster literature, the description of the evolutionary patterns of these systems has fueled a lively debate focusing on the sequence of development stages within the cluster life cycle. This research stream has the purpose to disentangle the conditions leading to clusters' evolution (i.e. emergence, growth, decline, and transformation) by considering the dynamics of actors, networks and institutions and their implications for clusters' development (Fornahl et al., 2015). In this regard, Menzel and Fornahl (2010) analyze the developmental stages within the cluster life cycle by focusing on the heterogeneity of firms' knowledge bases at each stage. They argue that through localized learning processes, enabled by firms' relative absorptive capacity and supported by cluster-specific institutions, clusters change the heterogeneity of knowledge, favoring the establishment of a “dominant design” around a certain knowledge base, or transforming the cluster into a set of firms with unconnected specializations.

Despite scholars' contributions explaining the development paths of localized industries based on the changes observed on the stock of knowledge, we still recognize the necessity to explore the trajectories of development of IDs for two reasons. The first one refers to the lack of a consistent conceptual framework taking into account the specific features of IDs, primarily with regard to the embeddedness of the industrial frame within the system's institutional and socio-cultural context. In the second place, we consider the development paths undertaken by IDs as the result of the changes observed on those systemic conditions contributing to the emergence of district external economies and thus to the reproduction of the district competitive advantage over time. Therefore, differently from prior literature focusing on the micro-level strategies of the firms determining a certain development path in the system, we relate the ID trajectories of development to the changes within the industrial frame (meso-level) and their implications for district external economies. Specifically, we assume that these changes observed within the industrial frame affect the stock of systemic knowledge, including the set of specialized know-how accumulated by the firms and the ideas and information diffused throughout the system, supporting or constraining the emergence of knowledge external economies. This is supposed to be due to the fact that a change of the endowment of know-how possessed by local firms and enmeshed with the institutional and socio-cultural context of the ID, may favor the accumulation of systemic knowledge through localized learning processes, or determine the loss of systemic knowledge through forgetting processes. On this basis, we justify the

trajectories of development undertaken by IDs as a result of the transformations observed on the stock of systemic knowledge.

By exploring the evolutionary patterns of IDs in terms of the changes observed on the stock of specialized knowledge possessed by local firms and on the capacity of adaptation of local institutions, we contribute to fill this gap on the development paths of IDs, and to achieve a deeper understanding of the effects of international openness. The aim of this research is twofold. In the first place, we present an original conceptual framework describing the endogenous cognitive processes characterizing IDs and leading to the accumulation (or depletion) of systemic knowledge. Secondly, we analyze the impact of internationalization on the industrial frame of IDs and thus on the endowment of specialized know-how, determining endogenous cognitive processes that modify the stock of systemic knowledge and affect the emergence of knowledge external economies.

The thesis is composed of three Chapters, which have been structured in the form of papers. In the First Chapter, we present the conceptual frame about the endogenous cognitive processes in Industrial Districts (IDs), resulting from the absorption and transformation of internal and external knowledge inputs. Specifically, we describe the endowment of specialized know-how as a multiplicity of nuclei, where each nucleus represents a group of firms having homogeneous competencies and skills (Bellandi and Santini, 2017). External linkages are expected to modify the composition of know-how nuclei, affecting the emergence of knowledge external economies and thus the process of knowledge accumulation in the system. The spawning of new nuclei and the expansion of existing nuclei fuel learning processes contributing to the increase of systemic knowledge. Conversely, the loss and contraction of know-how nuclei trigger forgetting processes determining a process of knowledge depletion in the system. The two effects may combine into an unlearning process, resulting from the depletion of parts of specialized know-how and the accumulation of new knowledge, which may describe the structural transformation of the ID (e.g. the shift into a new sectoral specialization).

After defining the cognitive processes in IDs and how international openness may interfere with them, we present two empirical investigations in the Second and Third Chapters, having the purpose to:

- analyze through a quantitative model, how the international openness of IDs may affect the innovation strategies of local firms by modifying the structural conditions leading to the emergence of knowledge external economies,

- observe through a case study analysis, what kind of cognitive processes may arise from internationalization, and how they may affect the trajectory of development of the system.

In the Second Chapter, we analyze how the type of internationalization strategies undertaken by the firms in the region, affects the innovation strategies of the ID firms located in the same territory. To do this, we use the distinction proposed by Driffield and Love (2007), among others, between two types of internationalization strategies, i.e. knowledge seeking and knowledge exploiting. While the first one corresponds to those strategies enabling firms to access new knowledge inputs on foreign markets, the second one describes the exploitation of the firm's specialized competencies on foreign markets. The amount of knowledge seeking and knowledge exploiting internationalization strategies is expected to affect the system's industrial composition and thus the endowment of specialized know-how. Therefore, by modifying the system's cognitive configuration, international openness can either support or constrain the emergence of external economies of learning, affecting the innovation strategies of the ID firms.

The Third Chapter has the purpose to disentangle the potential development paths that the ID can undertake from the variations observed in the cognitive frame due to international openness. To this end, we first recall the conceptual frame described in the First Chapter with some specifications, which are necessary to interpret the results of the application presented afterwards. Using a qualitative research design, we focus on the Macerata-Fermo footwear IDs in the Marche region (Italy), and analyze whether international openness is triggering learning, forgetting or unlearning processes, increasing the heterogeneity of know-how nuclei. On the basis of this case study, we expect to highlight those conditions that may favor (or limit) the competitive repositioning of the system within the same or into a new path of development after the structural shock determined by international openness.

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Learning, Unlearning and Forgetting in Industrial Districts: A Conceptual Framework

Abstract

The First Chapter focuses on the endogenous cognitive processes in Industrial Districts (IDs), resulting from the absorption and transformation of internal and external knowledge inputs. Specifically, we analyze how external linkages modify the composition of know-how nuclei, supporting or constraining further knowledge accumulation in the system. We identify four types of change of the ID multiplicity, leading to three different endogenous cognitive processes. The spawning and expansion of know-how nuclei trigger learning processes contributing to the increase of systemic knowledge. Conversely, the loss and contraction of know-how nuclei determine forgetting processes decreasing the stock of systemic knowledge. The two effects may combine into an unlearning process, reflecting the structural transformation of the ID. The conceptual framework is applied to inward and outward internationalization strategies, to observe how they interact with the ID cognitive dynamics, affecting the system's development path.

Keywords: Learning, Unlearning and Forgetting; Absorptive capacity; District Internationalization

1. Introduction

The endowment of systemic knowledge in Industrial Districts (IDs), developed locally through the combination of firms' specialized know-how and dense interactions among geographically and culturally close actors, is of utmost importance for the competitive advantage of the ID firms. This is due to the fact that ID firms benefit from a wider availability of specialized skills and competencies diffused throughout the local system, which supports their capacity to introduce innovations. As stated by Antonelli (2008) with regard to his definition of localized technological knowledge (LTK), knowledge is "localized" at different organizational levels (industry, region, firm and individual) as it contains elements of idiosyncratic knowledge, both tacit and codified, that are rooted in the history and experience of the learning agent. At the same time, however, LTK is subjected to the influence of external knowledge inputs – specifically, information and codified knowledge contained, for instance, in new technologies or in new scientific advancements,

but also tacit knowledge embodied into external agents or firms relocating their activities into the ID – implying a constant dialectic between the context and the external environment.

In this Chapter, we analyze the implications of the ID international openness for the endogenous cognitive processes. The endogenous cognitive processes refer to the processes of knowledge transformation occurring inside the district. While the transformation of knowledge is localized (i.e. district-wide), the knowledge inputs (e.g. new ideas, information) may derive both from the interactions within local networks, and from the relationships established by the ID actors (e.g. firms, institutions) with other actors external to the district, either located in the same nation or abroad. In this research, we focus only on cross-country external relations. Specifically, we consider those external relations deriving from the trans-local linkages that local agents (firms, public and collective bodies, families) establish with foreign agents located in a different country. Considering the continuous process of information and knowledge exchange between the internal and the external environment, we assume that the absorption and transformation of internal and external knowledge inputs, affects the ID configuration of firms' specialized know-how and thus the further accumulation of systemic knowledge. Lane et al. (2006) describe an analogous process-oriented framework for firms' absorptive capacity and identify three sequential processes in the utilization of external knowledge inputs, depending on the drivers that are internal (e.g. mental models of firm members) and external (e.g. characteristics of internal and external knowledge) to the firm. They argue that the ability of the firm to use external knowledge inputs starts from exploratory learning, through which the firm recognizes the value of external information and knowledge. This is followed by a process of assimilation and transformation of external knowledge inputs to combine them with the firm's existing knowledge stock. Lastly, through exploitative learning the firm applies the newly assimilated and transformed knowledge to its commercial purposes.

In order to analyze how the combination of internal and external knowledge inputs affects the accumulation of systemic knowledge, we need to first introduce the concept of ID absorptive capacity, standing for the capacity of the ID to capture external information and knowledge, and transform it through local experimental processes to accumulate new systemic knowledge. The level of ID absorptive capacity is related to the type of cognitive process that the ID is capable to undertake, generating different variations on the stock of systemic knowledge. Therefore, changes of the determinants of ID absorptive capacity,

especially with regard to the composition of nuclei which gather all of the ID firms having homogeneous specialized know-how, may open up to different cognitive processes. The expansion of the existing know-how nuclei or the spawning of new nuclei may trigger, in fact, explorative and exploitative learning supporting the accumulation of systemic knowledge. Conversely, the contraction or loss of know-how nuclei may determine the forgetting of parts of systemic knowledge.

In the second Section, we introduce the main features of the ID model, especially focusing on its nature as “cognitive laboratory” or “cognitive system” involved in continuous processes of knowledge creation, transformation and diffusion. After discussing in the third Section about the endogenous cognitive processes in IDs, the fourth Section focuses on the concept of absorptive capacity and recalls the main contributions from the management literature on firm-level absorptive capacity. On this basis, we develop our definition of ID absorptive capacity, relating the determinants stated beforehand to the district components and structures. In the fifth Section, we discuss about the impact of incoming and outgoing external linkages on the determinants of absorptive capacity, focusing on the implications for the composition of know-how nuclei inside the ID. We disentangle four types of change in the know-how nuclei’s composition and associate them with different cognitive processes leading to the variation of the stock of systemic knowledge. Furthermore, we consider the possible interactions among the four effects on the know-how nuclei’s composition, building up a more comprehensive framework on the development paths of the ID open to external relations. In the sixth Section, we apply our conceptual framework to the strategies of inward and outward internationalization, and analyze how these types of external linkages modify the cognitive structure of IDs, triggering either learning or forgetting processes. We conclude with some final remarks in the last Section.

2. IDs as learning organizations

The second industrial revolution praised the factory system based on large-scale and standardized production processes, as the most efficient organization of production. This certainty has not been denied until the second half of the twentieth century, when the increasing request for variety and customization from the demand side undermined the Fordist model of production and called upon new definitions of the existing industrial configurations. The shift from product standardization to product customization raised the interest towards artisan modes of production, usually concentrated in those economic systems based on the flexible integration of many small firms (Bellandi and De Propris,

2015; Bellandi, 2007). In the late Seventies, Giacomo Becattini reconsidered Alfred Marshall's speculations dating back to the start of the century on the emergence of external economies from localized industries, and enclosed the findings of his empirical observations into a comprehensive definition of the ID model. He defines the ID "as a socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area, where community and firms tend to merge" (Becattini, 1990: 38).

The ID model describes a specific type of localized industry characterized by a high degree of specialization and extended division of labor across the multitude of small and medium-sized firms within the main industry of specialization. As clearly expressed by its definition as a "socio-economic notion", the ID model emphasizes the interplay between the productive dimension, referred to as the system's industrial configuration, and the social dimension, represented by the local community of people working and living in the place. Therefore, the organization of production is not something detached from the community. In this regard, Dei Ottati (1994: 531) argues that "the fact that the division of labour between firms prevails over the division of labor within firms strengthens the reciprocal interdependence of the firms in the district and favors the perception of local industry (...) as if it were collective property". Favored by spatial proximity, the embeddedness of entrepreneurs and workers into the socio-cultural background of the place is thus key for their identification with the rest of the community.

The sense of belonging to a community sharing the same system of values, cultural traits and historical foundations, favors every kind of human exchange, from private affairs to economic transactions, whilst discouraging opportunistic behaviors (Dei Ottati, 1994). As such, the organization of the local division of labor is supported by a thick network of relations based on mutual trust and loyalty and representing the ID institutional frame¹. The institutional frame of the ID, intended as "the embedded socio-cultural structures of the civil society" (Asheim, 1996) that define altogether the identity of the place, including the system of values, culture, habits and traditions, is also conceived as a repository where tacit or "sticky" knowledge, invisible to the outside observers, is accumulated (Rullani, 2003). The nature of local relationships generates productivity advantages (i.e. external economies) for local producers in terms of quantity, quality, and innovative content,

¹ This feature of the ID led some authors to emphasize its nature as "social network cluster" (Belussi, 2015).

stemming from the wider opportunities to negotiate with local business partners, to access local specialized competencies, and to participate into a collective process of creativity and innovation. Deliberate actions by the local governance (i.e. teams of local firms and/or public institutions) further support these spontaneous processes giving them institutional recognition and purposeful organizational structure (Bellandi, 2009). As a result, firms realize increasing returns from the combination of internal economies (i.e. internal to the ID firm) and external economies (i.e. external to the ID firm but internal to the ID), the latter emerging from the complementarity and integration of “many complex networks of activities, overlapping *filières*, rival firms, co-operative subcontractors, specialized agents, and localized collective actors and institutions” (Belussi, 2015: 94).

The colloquial structure of the ID (Becattini, 2004) combined with its “high degree of specialization and complementarity” (De Propris et al., 2005: 110), enables a continuous flow of knowledge inputs throughout the organization, supporting the innovative efforts of local producers. The ID is therefore not only a social and productive system, but also a “cognitive system” (Rullani, 2003), insofar as it is capable to assimilate, spread and create knowledge through collective learning². In the next Section, we will focus on this last point, emphasizing how the ID enacts endogenous cognitive processes affecting the stock of systemic knowledge.

3. The cognitive configuration of IDs

The main rationale behind localized industrial agglomerations, is that industrial specialization triggers increasing returns in terms of innovation capacity, by facilitating external economies of learning that derive from the concentration of local workforce with industry-specific skills, of specialized suppliers with complementary know-hows, of specific institutions shaped around the characteristics of the main system’s technological field (Fritsch & Slavtchev, 2010). Nonetheless, industrial specialization can exacerbate lock-in effects and the system’s structural inertia, when it prevents the emergence and expansion of new industries (Grabher, 1993). For this reason, recent research has emphasized the importance of industrial diversity to allow for interactions across different, but related industries and to improve the opportunities for the introduction of radical innovations (Frenken et al., 2007). In this Section, we describe the cognitive configuration

² Camagni (1995: 203) defines collective learning as the “dynamic and cumulative process of production of knowledge, which is due to interaction mechanisms typical of an area characterized by a strong sense of belonging and relational synergies”.

of IDs as a set of specialized know-hows that are related not only to the main industry of specialization (i.e. the core), but also to the other industries embedded in the ID. This is because the interactions between core and non-core ID firms may also concur to the endogenous cognitive processes affecting the stock of systemic knowledge.

Conceived as a type of specialized local industry, the ID is endowed with a stock of systemic knowledge that represents the fundamental resource for the system's economic success. Systemic knowledge is "the stock of socially embedded knowledge" (Belussi and Pilotti, 2002: 128), and derives from processes of accumulation and depletion rooted in the history of the place. Being a social phenomenon, the stock of systemic knowledge is developed through interactions within local networks (Lundvall, 1996), where transactions are framed by the system's institutional set-up encouraging efficient relationships based on trust and loyalty (Dei Ottati, 1994).

Becattini (2004) defines two worlds of knowledge coexisting in IDs, one referred to a formal kind of knowledge which results from the systematization of knowledge into blocks that it is easier to transmit in space and time, the other one regarding practical knowledge that cannot be articulated in standard channels of knowledge transmission, such as textbooks, rather it can be accumulated through direct experience in production (i.e. learning-by-doing), product-using (i.e. learning by using), and interaction with other ID agents (i.e. learning-by-interacting) (Bellandi, 1992; Jensen et al., 2007)³. The combination of explicit and tacit elements generates a highly specific knowledge endowment, which is defined by Antonelli (2008) as "localized technological knowledge" (LTK). In line with Antonelli, we argue that the accumulation of systemic knowledge depends on the exchange of knowledge inputs between the internal and the external environment, and their further recombination through local experimental processes⁴.

As argued in the previous Section, the ID production organization has not only an economic meaning but also a cultural value, as the presence of a socially embedded, specialized industry contributes to develop a common knowledge base, and thus to increase the identification of the community with the territory. Therefore, at the foundations of collective learning lies the division of labor into a multitude of specialized producers (final firms and phase firms), each of them contributing with its own expertise to enrich the

³ This is consistent with the DUI mode of innovation proposed by Jensen et al. (2007) and based on the idea of knowledge accumulation through learning-by-doing, learning-by-using and learning-by-interacting.

⁴ Antonelli defines four "forms of information processing" (learning, socialization, R&D, and recombination), which allow to distinguish between the types of learning processes occurring between the organization and the external environment. For further information see Antonelli (2008).

cognitive core, represented by the set of know-hows, skills and competences related to the ID main industry of specialization. However, consistently with the idea that industrial variety contributes to improve the innovation capacity of the main industry of specialization, we need to extend the ID cognitive frame to the entire local society, made up of the main industry of specialization (i.e. the cognitive core) and the other localized industries. This is to consider the opportunities for knowledge creation and introduction of innovations that may arise from the connections that the firms within the ID core establish with the firms outside of the core (but internal to the ID).

In order to disentangle the endogenous cognitive processes affecting the stock of systemic knowledge, we conceive the ID cognitive frame as a multiplicity of “nuclei of productive know-how”, each including activities that are homogeneous in terms of know-how, competences and firms’ characteristics (Bellandi and Santini, 2017). Inside the ID cognitive frame, we identify the set of nuclei representing the division of labor within the main industry of specialization (i.e. the ID cognitive core), and the set of nuclei referred to the other industries of the ID. A high degree of cognitive proximity favors frequent and stable interactions within the cognitive core, promoting incremental learning based on the “exploitation of old certainties” (March, 1991: 71). Nonetheless, the openness of the cognitive core’s nuclei to linkages with other non-core ID nuclei and/or with agents being external to the ID, triggers learning processes based on the “exploration of new possibilities” (March, 1991), that may lead to the renovation of the variety of specialized practices inside the cognitive core through the expansion of the existing nuclei or the spawning of new nuclei. As stated in March (1991), exploitation implies an adaptation of knowledge configuration based on the refinement of existing technologies and practices, and the improvement of efficiency, thus implying investments on the best of currently observable activities and returns being more predictable and close in time. Diversely, exploration refers to a type of learning process addressed to acquire information about new alternatives (i.e. “new ideas, market, relations”, March, 1991: 73) through investments in experimentation and discovery of new varieties whose returns are uncertain and distant in time.

Accumulation of knowledge in IDs occurs through a systemic and decentralized process of learning by exploiting and by exploring, or decentralized industrial creativity (DIC), corresponding to the joint participation of a large group of producers to build up new knowledge or new combinations of existing knowledge by sharing their specialized practices through frequent interactions (Bellandi, 1992). Therefore, the reutilization and

recombination of dispersed pieces of specialized practices through DIC fuel non-linear types of innovation based on continuous incremental innovation, spotted with radical Schumpeterian novelties (Belussi, 2015). In this regard, Antonelli (2000, 537) affirms that “in a world where nobody can claim full control of all existing knowledge, each agent possesses diverse and yet complementary pieces of information and knowledge which are not only useful per se, [...], but also for broader and different uses. In a parallel way, it is clear that each individual advance is not only useful for the specific dedicated purpose for which it has been elaborated but also for a variety of other possible uses”.

Accumulation of knowledge is not the only variation that we observe in ID systemic knowledge. In line with Maskell and Malmberg (1999), we argue that localized know-hows, skills and competences can incur a process of deterioration, generating a decreasing variation on the stock of systemic knowledge. Referring to firm-level organizational learning, Argote et al. (1990) argue that “knowledge could depreciate because individuals forget how to perform their tasks or because individuals leave and are replaced by others with less experience”. In the same way, we consider forgetting in IDs as a process which leads the cognitive core to a partial or integral loss of specialized knowledge, resulting from the contraction or loss of know-how nuclei and of the cognitive relations that they had established with other nuclei. The ID multiplicity is thus weakened, reducing the opportunities for further DIC-based learning.

In some cases, forgetting certain know-hows, skills and competences embedded into standard operating procedures and organizational routines, may be advisable to enable new learning opportunities and open up to new paths of development (Lundvall, 1996). The combination of learning and forgetting processes results into a process of unlearning, representing the bedrock for the system’s structural change, as some technical knowledge embedded into certain specialized nuclei is forgotten, whilst the process of learning new technical knowledge can lead to the emergence and expansion of other know-how nuclei.

4. The role of absorptive capacity in organizational learning processes

The leading argument in firm-level organizational learning is that firms learn primarily from their experience by repetitively doing production activities or by using certain products or machines, accumulating knowledge in daily operations within their technical context (Antonelli, 2000). Thus, learning is a cumulative process, either finalized to the improvement of production efficiency as emphasized in the organizational learning literature (Dosi, 2016; Argote et al., 1990), or favoring the development of skills and

competences that may fuel creative behaviors and incremental innovations, as we observe from the analysis of specialized local industries (Bellandi, 1992).

In 1989, Cohen and Levinthal contributed to a deeper understanding of the dynamics of organizational learning, introducing the concept of absorptive capacity. They define absorptive capacity as the set of a firm's abilities "to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990: 128). The organizational learning process is thus subjected to the influence of external knowledge inputs enabling firms to learn doing something different, rather than being only the expression of intramural accumulation allowing firms to do something in a better way. Drawing upon seminal contributions from the management literature, we can identify the determinants of absorptive capacity, corresponding to:

- Prior knowledge (Cohen and Levinthal, 1990; Van den Bosch et al. 1999);
- Organizational structure, conceived "as a type of infrastructure which enables the process of evaluating, assimilating, integrating, and utilizing knowledge in a specific way" (Van den Bosch et al., 1999: 554; in this regard, also Lane and Lubatkin, 1998);
- Configuration of internal and external capabilities and their complementarities (Lewin et al. 2011; in this regard, also Kogut and Zander, 1992; Van den Bosch et al., 1999).

The level of a firm's absorptive capacity depends on its prior knowledge, which partly overlaps the new knowledge inputs in its basic contents, such as languages and techniques, to favor communication and understanding, whilst partly showing a certain degree of diversity to enable the creative redeployment of new information (Lane and Lubatkin, 1998). From this perspective, we understand that the development of absorptive capacity is a cumulative and path-dependent process, moving in accordance with the expectations formed by the firm on the value of emerging technological advances. The cumulativeness of absorptive capacity implies that improvements in absorptive capacity are incremental, and that the accumulation of absorptive capacity in one period determines the preparedness of the firm to further accumulate absorptive capacity in the next periods (Cohen and Levinthal, 1990; 1994). A firm that has developed a certain level of absorptive capacity in a specific field, is more prepared to undertake an additional investment and to increase its absorptive capacity in that field whenever a new technological opportunity comes out. Thus, the level of absorptive capacity today not only determines the future development of

absorptive capacity, but it also shapes the expectations of the firm about the value of new technologies. This is consistent with the feedback loop suggested by Cohen and Levinthal (1990) and more recently reaffirmed by Lewin et al. (2011), where absorptive capacity and learning are “coevolving and mutually reinforcing” (Lewin et al. 2011: 82), insofar as the firm’s absorptive capacity is related to learning, which determines the accumulation of new knowledge implementing the existing level of absorptive capacity.

AC → learning → new AC

In addition to these considerations, the development of absorptive capacity follows a path-dependent trend, insofar as the firm’s level of absorptive capacity in one period will determine the set of technological opportunities that the firm will be able to grasp in the next periods. This implies that the level of a firm’s absorptive capacity anticipates the trajectories that the firm will be able to undertake in the future, and it is also revealing about its capacity to sustain the costs to reach the required level of absorptive capacity at a subsequent stage (Cohen and Levinthal, 1990).

The organizational structure affects the way in which knowledge is absorbed and processed inside the firm. Being one of the determinants of absorptive capacity, the organizational structure contributes to define the firm’s potential for knowledge absorption and thus its level of absorptive capacity. In this regard, Van den Bosch et al. (1999) distinguish among three organizational forms, namely the functional, divisional and matrix forms, and analyze the potential for knowledge absorption in each of them. They argue that the functional form shows a high potential for the efficient use of knowledge attaining from economies of scale, overheads and skills, but a low propensity for knowledge absorption; the divisional form, is characterized by a high propensity for knowledge absorption at the level of single organizational sub-units but a low capacity of absorption and integration of knowledge across multiple units; and the matrix form, has the highest potential for knowledge absorption, both within the single unit and across different units. The leading argument is that a hierarchical organizational structure increases the rigidity of the organization, hampering the communication among the subunits and thus the timely adaptation of the level of absorptive capacity to new external conditions (Lewin et al., 2011; Van den Bosch et al., 1999).

Drawing upon the framework proposed by Lewin and Massini (2003) and further extended by Lewin et al. (2011), we consider the set of capabilities enabling knowledge absorption, as one of the determinants of absorptive capacity. Based on the wide literature stream

focused on the concept of routines (e.g. Cyert and March, 1963; Nelson and Winter, 1982), Lewin et al. (2011) identify the micro-foundations of the firm's internal and external capabilities of absorptive capacity, stemming from a set of conceptual "meta-routines" and their expression in the form of practiced routines. By dividing the set of capabilities related to the firm's absorptive capacity into internal and external capabilities and classifying the correspondent meta-routines in each category, the authors emphasize that knowledge creation can originate from internal processes of exploration based on internal variation, selection and replication (Nelson and Winter, 1982), and from the external exploration of new knowledge existing in the environment.

4.1. Absorptive Capacity in IDs

As argued in the previous Section, the firm's absorptive capacity depends on its prior knowledge conditioning its capacity to recognize the value of emerging technological advances and to exploit them; on its organizational structure affecting the way in which knowledge is transmitted throughout the organization; and on a list of internal and external capabilities expressing the ability of the firm to develop certain mechanisms that allow for the creation and diffusion of knowledge, combining ideas and information emerging from the internal and external environment. Drawing upon the extensive literature on absorptive capacity at the level of the firm, we adapt the concept of absorptive capacity to a different type of organization, that is the ID, in order to understand the conditions that enable the absorption of internal and external knowledge inputs and their following integration with the existing stock of systemic knowledge.

The attempts to extend the definition of absorptive capacity to a "meso" organizational level (rather than the micro-level represented by the single firm), come from the literature exploring the dynamics of clusters' networks. Giuliani (2005) builds on the seminal paper by Cohen and Levinthal and associates the cluster's ability to absorb external information with the presence of firms endowed with stronger knowledge bases (i.e. the technological gatekeepers) in terms of the skills possessed by employees and the higher investments in in-house knowledge generation, for instance through R&D; with the structure of the intra-cluster knowledge system, corresponding to the network through which pieces of tacit and explicit knowledge are diffused inside the cluster; and with the presence of extra-cluster linkages favoring the absorption of external information. In their analysis of clustered firms' capabilities to absorb external knowledge, Hervas-Oliver and Albors-Garrigo (2009) emphasize that the generation of knowledge depends not only on firms' internal resources,

but also on those relational assets that are embedded into the socio-institutional context of the cluster, such as firm-to-firm networks and the collaborations between firms and local institutions, especially when they are research-oriented (e.g. Universities, research institutes). The concept of cluster absorptive capacity proposed by Giuliani (2005) and Hervas-Oliver and Albors-Garrigo (2009) confirms Cohen and Levinthal's idea that the absorptive capacity of the organization depends on the absorptive capacities of its members. However, the absorptive capacity of the organization is not simply the sum of the individual absorptive capacities, as there are certain aspects at the organizational level that need to be considered, such as the structure of communication among the ID actors (e.g. firms and institutions) and between the ID actors and the external environment.

Although the definition of cluster absorptive capacity represents an example of how the concept can be applied to localized industries where the organizational members are the firms and the structures of communication refer to institutional networks, we need to further adapt it to the ID specific features. This is to highlight the role of "communitarian markets" in the exploration of internal and external knowledge inputs, which is overlooked by cluster theory (Dei Ottati, 1994b). To this end, we adopt the definition of ID absorptive capacity, reflecting the propensity to assimilate, diffuse, and creatively transform internal and external knowledge inputs, modifying the stock of systemic knowledge.

Table 1 describes the main components of the ID absorptive capacity, namely the multiplicity of know-how nuclei, the structure of local networks and a set of systemic capabilities that enable the recombination and integration of external knowledge inputs with locally generated knowledge.

Table 1: Determinants of the ID absorptive capacity. Source: Author's elaboration.

Determinants of AC	Specification of the AC determinants
Multiplicity of know-how nuclei	Number Dimension
Network structure	Network closure Structural holes
Organizational capabilities	Internal Capabilities External Capabilities

4.1.1. Multiplicity of know-how nuclei

Having in mind that prior knowledge represents one of the determinants of absorptive capacity, we argue that the ID absorptive capacity affects and is affected in a path-dependent way by the knowledge accumulated locally, previously defined as systemic

knowledge. Therefore, the first element contributing to the definition of the ID absorptive capacity stands from the set of know-how nuclei, that is on the stock of specialized know-how accumulated by the ID firms. When analyzing the contribution of the know-nuclei to the accumulation of absorptive capacity, we have to consider two conditions, that is, their number and heterogeneity (i.e. dimension). The number of nuclei within the ID determines the variety of specializations in the system. The single nucleus is involved in a process of accumulation of technological capabilities and skills through experience, and therefore it represents a specialized “technological field”, which contributes to the generation of systemic knowledge in its own domain. Frenken et al. (2007: 687) analyze the relationship between variety and regional economic growth, emphasizing that “the diverse industry mix (...) improves the opportunities to interact, copy, modify, and recombine ideas, practices and technologies across industries”. According to this view, the diversity of industries enables knowledge exchanges across different, but related technological fields, facilitated by geographical proximity and embeddedness into the same institutional frame⁵. Similarly, the ID cognitive frame, composed of the know-how nuclei inside and outside of the ID cognitive core, identifies the diversity of specializations inside the system, and thus its endowment of different technological fields. Boschma and Iammarino (2009) explore the contribution of extra-local sources of knowledge arising from external trade linkages for regional economic growth, measured by employment growth, value-added growth, and labor-productivity growth. Their findings show that it is not a high variety of trade linkages (and thus of extra-regional knowledge sources) to matter for regional economic growth, but rather the relatedness between the technological fields in the region and the extra-local sources of knowledge, as this increases intersectoral and cross-boundary learning opportunities and positively impinges on regional economic growth. As such, we argue that the diversity of the know-how nuclei configuration in IDs positively affects the potential to absorb external knowledge inputs, because it increases the opportunities for local and extra-local exploration processes based on wider intersectoral cognitive relatedness.

The importance of industrial variety for inter-sectoral learning processes should not underestimate the role of specialization in increasing the potential of knowledge absorption. It is widely agreed in the literature, that in the evolution of localized industries, specialization initially enables increasing returns from the emergence of external

⁵ Boschma and Iammarino (2009: 292 - 293) define related variety “as sectors that are related in terms of shared or complementary competences”.

economies, reinforcing the growth of the industry with respect to the rest of the system (Martin and Sunley, 2006). During this stage of development, the system is fully committed to undertake learning processes by collecting knowledge inputs from local and extra-local knowledge sources, which are supported by (and further contribute to fuel, as in the feedback loop described above) a high level of absorptive capacity. Nevertheless, the expansionist trend may cease in the maturity phase, when the local learning processes are impoverished, and the forgetting processes due to different triggering factors (e.g. structural shocks following economic crises, delocalization practices) reduce the multiplicity of know-how nuclei, undermining the system's absorptive capacity. In a similar way, the heterogeneity of the ID know-how nuclei may reveal the different stages of evolution regarding the ID sectors. By observing the nuclei configuration in two different points in time, we can say that the ID is having a higher absorptive capacity in those technological fields showing an expansionist trend due to ongoing learning processes, with respect to the other nuclei that are growing slower or are indeed shrinking.

4.1.2. The structure of local networks

As seen in the model by Van den Bosch et al. (1999), the organizational form determines how knowledge is processed inside the organization, and thus it affects how the firm performs the different phases of absorption of external knowledge inputs. The studies on localized industrial organizations, such as industrial districts and clusters, have dealt with the analysis of the organizational structure focusing on the form and properties of the internal communication networks. Recently, the literature has contributed to a deeper understanding of the implications of different network structures and properties for the transfer of knowledge among the network's nodes (Giuliani, 2013; Crespo et al. 2013). The debate on the nature of local linkages for achieving high performances in learning and innovation has started though a longer time ago with the analysis of the adequate degree of embeddedness for knowledge sharing. Embeddedness is related to the importance of establishing tight social linkages among actors, being thus influential for their economic actions. In presence of a high level of embeddedness, actors are likely to develop relations based on trust and mutual-understanding which favor cooperative behavior and knowledge transfer (Pyke et al., 1990). Further studies on firms' embeddedness in clusters have posited that the degree of embeddedness has a non-monotonic effect on learning and innovation. This is due to the increasing rigidity of the embedded social linkages to external collaborations (Ahuja et al., 2009), which may cause lock-in and over-embeddedness in the

long run (Uzzi, 1997). Giuliani (2013) and Crespo et al. (2013) have discussed the role of embeddedness for knowledge sharing from a network-based perspective, presenting two different structures of local ties that affect the process of knowledge diffusion. The first type of network structure, commonly known as network closure, emphasizes the importance of establishing trust-based and cohesive relationships that reduce uncertainty and information asymmetries between two interacting firms. In terms of knowledge sharing, network closure prompts collaborative relations inducing the firms to share more complex knowledge inputs (e.g. tacit knowledge) and to participate into a joint process of incremental knowledge creation. Conversely, the structural hole theory supports the idea that the presence of “holes” in the network allows agents to explore diverse knowledge sources by establishing a bridge with other agents being related to a different set of nodes. Therefore, agents on the opposite side of a hole bridge otherwise disconnected firms, enriching the system with nonredundant knowledge sources and thus boosting learning processes (Zaheer and Bell, 2005).

In a similar vein, we define the organizational structure of the ID in terms of the network structure among the know-how nuclei, inside and outside of the ID cognitive core. By taking into consideration the ID network structure to define the ID absorptive capacity, we emphasize the key role of the institutional frame in supporting the endogenous cognitive processes and in contributing to the system’s structural changes. The institutional frame corresponds to locally established practices, norms and policies, which facilitate trust-based relationships and thus increase coordination in local exchanges.

Inside the ID, network closure refers to the establishment of a dense network of relationships, favored by spatial and cognitive proximity. The embeddedness of local actors into a stable and cohesive network and the ease of sharing specialized practices, ideas and opinions, represents one of the local determinants of competitive advantage in terms of external economies of learning. Network closure is thus the most efficient type of organizational structure to exploit internal knowledge endowments contributing to the accumulation of systemic knowledge. The presence of structural holes and the correspondent development of bridging strategies among the know-how nuclei, enables a certain degree of knowledge diversity and recombination. As argued by Crespo et al. (2013), bridging strategies are necessary when the network experiences a phase of reorganization or decline, because the inject of new ideas by bridging structural holes may trigger new learning processes and start new paths of development. Therefore, we argue that the presence of structural holes in the ID network structure reflects a higher propensity

to trigger local learning processes based on the exploration of more diverse knowledge sources. Neither of the two network structures prevails over the other *per se*, but the two of them are influential for the learning path that the ID may undertake and thus for its potential of external knowledge absorption. Network closure describes a favorable condition for the exploration of knowledge sources sharing a certain degree of cognitive proximity with the internal multiplicity, identifying a stable path of development for the system, whilst structural holes may trigger explorative learning of nonredundant knowledge sources, as required in a more dynamic and rapidly changing environment (cfr. Van den Bosch et al., 1999; Crespo et al., 2015; Zaheer and Bell, 2005).

4.1.3. Internal and External Capabilities

Our definition of ID absorptive capacity focuses on the ID ability to explore internal and external knowledge inputs and to recombine them with the existing stock of systemic knowledge embedded into the ID cognitive and institutional frames. The concept of ID absorptive capacity implies a dialectic between processes of knowledge creation internal to the ID and based on decentralized industrial creativity, and processes related to the exploration of knowledge generated in the external environment.

After identifying the multiplicity of know-how nuclei and the configuration of their network structure, a focus on the ID capabilities related to absorptive capacity enables a better understanding of the processes and activities put in place by the system to generate new systemic knowledge from the combination of pieces of internal and external knowledge inputs. In this regard, we need to make a necessary distinction between the formulation of a capability-based view of absorptive capacity (AC) regarding firms and the one referred to IDs. Firm capabilities result from deliberate acts expressing the strategic orientation of the firm's management. In this sense, the building up of organizational capabilities is based on intentionality. In fact, "capabilities fill the gap between intention and outcome (...) in such a way that the outcome bears a definite resemblance to what was intended" (Dosi et al., 2002: 2)⁶. In IDs, we do not have a "master mind" governing the endogenous learning processes, whose complexity derives from the non-linear interactions (implying feedback loops and increasing returns) among firms, people and institutions (Rullani, 2003: 64). Therefore, ID capabilities correspond to organized activities emerging as systemic outcomes of spontaneous actions as well as of deliberate interventions

⁶ The specific exercise of capabilities can be, however, intentional or automatic (Dosi et al., 2002).

introduced by the local governance.

Before analyzing the internal and external capabilities that support ID absorptive capacity, it is worth mentioning the background where all routines and processes take place, which affects the behaviors of local actors and thus the effectiveness of ID capabilities, as emphasized in the original model by Lewin et al. (2011). A set of sociocultural norms, values and mechanisms recognized and adopted by the local community, define an environment based on “shared values, predictable behaviors, unspoken rules and socially controlled procedures” (Rullani, 2003: 73), that determine the level of participation and embeddedness of local actors into local networks and thus influence the processes underneath the creation and diffusion of systemic knowledge.

The decomposition of internal AC capabilities highlights the processes undertaken by ID agents (firms, institutions, local community), to:

- ensure a variety of specialized knowledge sources inside the ID enabling complementary and substitutive multiplicity (Bellandi, 2003),
- enable diffused exploratory searches, which do not limit experimental processes to a small bundle of innovative projects as we observe for the single firm (Rullani, 2003),
- share knowledge across the ID, and
- update obsolete procedures, products and technologies.

As we have previously underlined, the variety of specializations and their synergies arising from the division of labor and from a highly self-contained value chain, is the first determinant for the creation of new ideas in the ID. An example of factors enabling the expansion of local specializations refers to the lively entrepreneurial dynamism characterizing the phases of ID growth, when technical people with a high level of professionalism decide to leave their former employer and start a business on their own. Also, the intervention of local institutions may support the local division of labor by introducing rules and norms that limit uncertainty and favor cooperation across the *filière* (Belussi, 1999; Rullani, 2003).

The division of labor across a mass of independent producers and the decentralized industrial creativity arising from the interdependencies among many complementary specializations, affect the processes that underlie the accumulation of knowledge in the ID (Maillat, 1998). While single firms have to select a small bundle of projects to invest in due to the scarcity of financial and managerial resources, inside the ID the research costs are

divided by many firms allowing “parallel efficient exploratory searches” (Rullani, 2003: 75). The selection of winning projects comes from the appreciation expressed by the market on the new products. In this setting, each producer specialized in a very specific activity can have access to other producers’ specialized knowledge with limited costs and rapidly, or cooperate with suppliers and customers to introduce innovative solutions. Thus, diffused exploratory searches are facilitated by the rapid propagation of specialized know-how through involuntary sharing of ideas and information due to proximity, and voluntary cooperation with partners (Rullani, 2003).

Connected to the factors enabling diffused exploratory searches, a component of ID internal AC capabilities resides in the processes that facilitate knowledge sharing inside the system. These primarily refer to the presence of dense social and productive networks, in which knowledge sharing occurs through informal events and face-to-face contacts between local people, as well as through formal agreements between the firm and its suppliers, providers of machinery, service firms, and customers (Belussi and Pilotti, 2002). A further example of knowledge transfer is the imitation of tasks and skills, for instance in the event of on-the-job training.

The ID capabilities related to the updating of obsolete products, processes, and technologies are generally associated with the presence of “technologically dynamic firms” (Belussi and Pilotti, 2003) investing in new technologies and thus working as “activators of knowledge and competencies” (Belussi and Pilotti, 2002). Such leading firms own the financial and managerial structures to afford the costs and the risks of building up new technological knowledge, acting sometimes as pioneering enterprises with the introduction of radical technological innovations. The introduction of innovations by leading firms enlarges the knowledge gap among district agents, fueling “generative relationships” within the local networks (Lane and Maxfield, 1996). Favored by the ease of knowledge propagation, a larger group of follower firms have access to the innovations developed by the leading firms, and adopt them by means of emulative behaviors (Belussi and Pilotti, 2002). In this context, the rapid diffusion of know-how and the boost to creative and innovative processes, stimulates continuous product variation and innovation and the acquisition of the best available technology, depicting a scenario of hyper-competition among local producers (Belussi, 1999).

As anticipated before, the management of ID processes is not in the hands of a centralized authority. The wide adoption of innovative strategies and the correspondent change in the systemic processes is more an emergent phenomenon accelerated by high local

competition, and facilitated by the ID mechanisms of knowledge diffusion. However, the literature presents examples of factors that support the creation of convergent expectations among the local actors, for example through the introduction of collective initiatives. In this context, deliberate public and private actions may be addressed to trigger the internal and external exploration of new ideas (for example, the introduction of trans-local public goods establishing a network of business and institutional relations between the district and the foreign cluster, and gradually enabling the exploration of external specialized competences, as discussed in Bellandi and Caloffi, 2008).

External AC capabilities include those processes that ID agents (specifically, firms and institutions) undertake to explore external knowledge inputs, from and with external organizations (i.e. external firms and institutions, foreign clusters). With regard to the identification and assimilation of external knowledge inputs, Morrison (2008) and Morrison et al. (2013) recognize the contribution of firms having the strategic role of knowledge gatekeepers inside the ID. They are defined as firms with “strong knowledge bases and (...) tight external links (...) willing to diffuse their knowledge within the cluster” (Morrison et al. 2013: 78). Knowledge gatekeepers invest in learning relationships with distant actors updating their knowledge bases and routines. By means of their linkages within the ID, they also contribute to enhance variation in the stock of systemic knowledge. In addition to local knowledge gatekeepers, other types of external linkages may trigger the exploration of new external knowledge sources. In this regard, we mention the relocation inside the ID of external firms or multinationals, willing to exploit local competitive advantages (e.g. ample availability of specialized competences) and, at the same time, bringing with them a set of new assets, such as their global networks or advanced financial and managerial resources. Furthermore, Becattini and Rullani (1996) recognize the potential of special events (e.g. exhibitions, technical meeting) for having access to a circuit of codified global knowledge by adopting shared communicative codes. In this regard, we also mention the collaborations that firms may establish with local and extra-local universities, research institutes and end users, fueling a process of learning and innovation that overcomes the firm’s boundaries (Amison and Bailey, 2014).

Sharing external knowledge inputs within the ID and further integrating them with the existing stock of systemic knowledge, lies at the interface between internal and external exploration processes. At this stage, new knowledge sources accessed through external exploration capabilities, is diffused within the ID, and further recombined with those knowledge inputs generated through internal exploration processes (see, ID internal

capabilities). A number of institutions facilitates the contextualization of external knowledge inputs, such as training schools, entrepreneurial associations, service centers, and research laboratories (Belussi and Pilotti, 2003).

Table 2: Internal and external capabilities supporting ID absorptive capacity. Source: Author's elaboration.

	Firm AC capabilities (Lewin and Massini, 2003; Lewin et al. 2011)	District AC capabilities	Examples of district AC capabilities
	<i>Internal Capabilities</i>		
Sociocultural norms, values and mechanisms	Facilitating variation <i>Adopting processes and norms that facilitate the emergence as well as the exploration of new ideas inside the organization</i>	Enabling and balancing complementary and substitutive multiplicity (Bellandi, 2003)	Entrepreneurial dynamism triggering the expansion of local specializations Introduction of local policies supporting and regulating the local division of labor (Belussi, 1999)
	Selecting ideas <i>Identifying processes that enable the organization to select the projects and activities to invest in</i>	Enabling diffused exploratory searches	Co-existence of multiple experimental processes fueled by involuntary knowledge sharing and voluntary cooperation
	Sharing knowledge across the organization <i>How the organization shares specialized knowledge and information</i>	Sharing knowledge across the district	Frequent overlapping of social and productive networks (Belussi and Pilotti, 2002) Tasks and skills imitation, on-the-job training
	Reflecting on, Updating and Replicating <i>How the organization reflects on, and updates obsolete procedures, technologies, products and processes</i>	Updating obsolete products, processes and technologies	Technologically dynamic firms (Belussi and Pilotti, 2003) investing in new technologies and thus working as “activators of knowledge and competencies” (Belussi and Pilotti, 2002) Hyper-Competition (Belussi, 1999: 736) Emulative behaviors (Belussi and Pilotti, 2002)
	Managing adaptive tension <i>Creating goals and expectations that stimulate change</i>	Managing adaptive tension through the local governance structures	Support by district institutions to create convergent expectations Introduction of public and private initiatives to foster internal and external exploration
	<i>External Capabilities</i>		
	Identifying and recognizing the value of external information	Assimilating external knowledge inputs	Contribution of gatekeepers to tap into external knowledge sources and to transfer the new knowledge

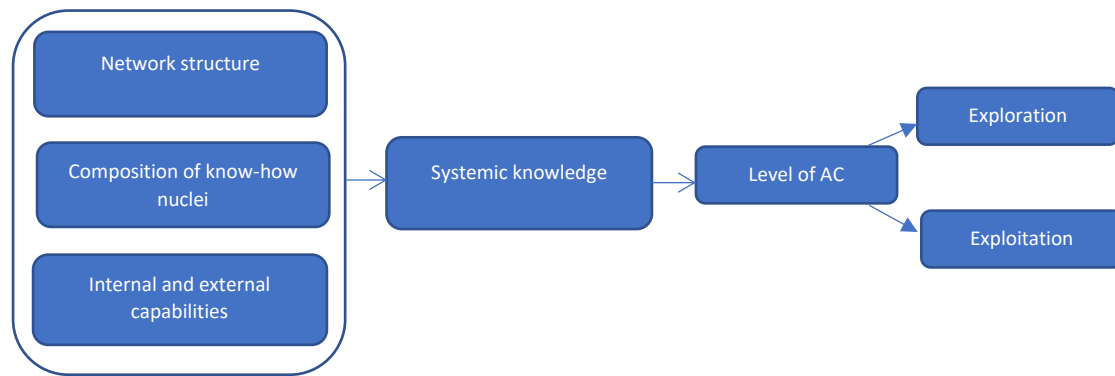
			inputs into local business networks (Morrison, 2008; Morrison et al., 2013)
	Learning from and with external partners, suppliers, customers, competitors, and consultants (open innovation)	Learning from and with external organizations (i.e. external firms or institutions, foreign clusters)	Relocation inside the district of external firms or multinationals Participation into exhibitions and technical meetings, collaborations with universities as examples of strategies to access a circuit of codified global knowledge (Amison and Bailey, 2014; Becattini and Rullani, 1996)
	Transferring external information back to the organization	Integrating external information with contextual knowledge	Local training schools, entrepreneurial associations and service centers, ad hoc founded research laboratories contributing to contextualization of external information

5. Impact of external knowledge inputs on the endogenous cognitive processes

After defining the key concepts supporting the ID cognitive processes, we analyze how they are related, determining knowledge accumulation and depletion in the system.

Figure 1 highlights the relationships between the determinants of ID absorptive capacity and the propensity of the ID to start a path of learning based on exploration and exploitation. As we emphasized in the previous Sections, the level of ID absorptive capacity depends on the stock of systemic knowledge, resulting from the knowledge embedded into the know-how nuclei (multiplicity), the structure of local networks, and the set of internal and external capabilities enabling the system to combine internal and external knowledge inputs and create new pieces of systemic knowledge. As argued by Van den Bosch et al. (1999), the potential for knowledge absorption determines the firm's sensitivity to emerging technological opportunities, that is its propensity to undertake a learning path either based on the exploration of new knowledge inputs from the internal and external environment, or on the exploitation of the firm's current knowledge assets.

Figure 1: Absorptive capacity in industrial districts: static framework. Source: Author's elaboration.



In reality, we observe many types of shocks affecting the ID cognitive processes, such as the introduction of a new technology, policy interventions, and ID internationalization processes. Among those factors, we focus on the system's openness to international relations, established by ID firms and institutions with foreign partners (firms and/or institutions) to pursue different goals (e.g. increase efficiency, search for new resources and new markets). The establishment of external linkages modifies the organization of production inside the ID core, affecting the determinants of ID absorptive capacity and thus the system's learning opportunities (Figure 2). Specifically, the internationalization of IDs determines the change of the industrial composition within the know-how nuclei (i.e. the multiplicity), of the interdependencies across the nuclei inside and outside of the core, and finally of the systemic internal and external capabilities supporting knowledge absorption. These changes impact on the learning processes that underlie the ID capacity to generate new systemic knowledge from the combination of prior knowledge with new knowledge inputs generated internally and externally. For instance, the loss of complementarities across local actors may be detrimental to knowledge creation and diffusion, while the creation of new ties may instill fresh ideas in the system due to higher knowledge variety. As argued before, the change of the determinants of absorptive capacity determines the propensity of the ID to undertake a process of knowledge adaptation based on either exploration or exploitation. Consistently with this distinction, we associate two different outcomes in terms of the change observed on the stock of systemic knowledge by the attainment of one of the two paths of learning. We associate the exploration path with a radical change of systemic knowledge induced by the assimilation, diffusion and transformation of a new source of knowledge which is very distant (radically different) from the stock of knowledge available in the ID at a specific moment in time. The capacity

of the ID to absorb external knowledge inputs, may open up to new paths of development brought by the radical transformations of the existing configuration of systemic knowledge. Exploitation leads to incremental changes of systemic knowledge identifying a learning process that produces gradual (incremental) variations of the knowledge stock, and thus reflecting a more “conservative approach” to the existing stock of systemic knowledge.

Figure 2: Absorptive Capacity in industrial districts: dynamic framework (part a). Source: Author’s elaboration.

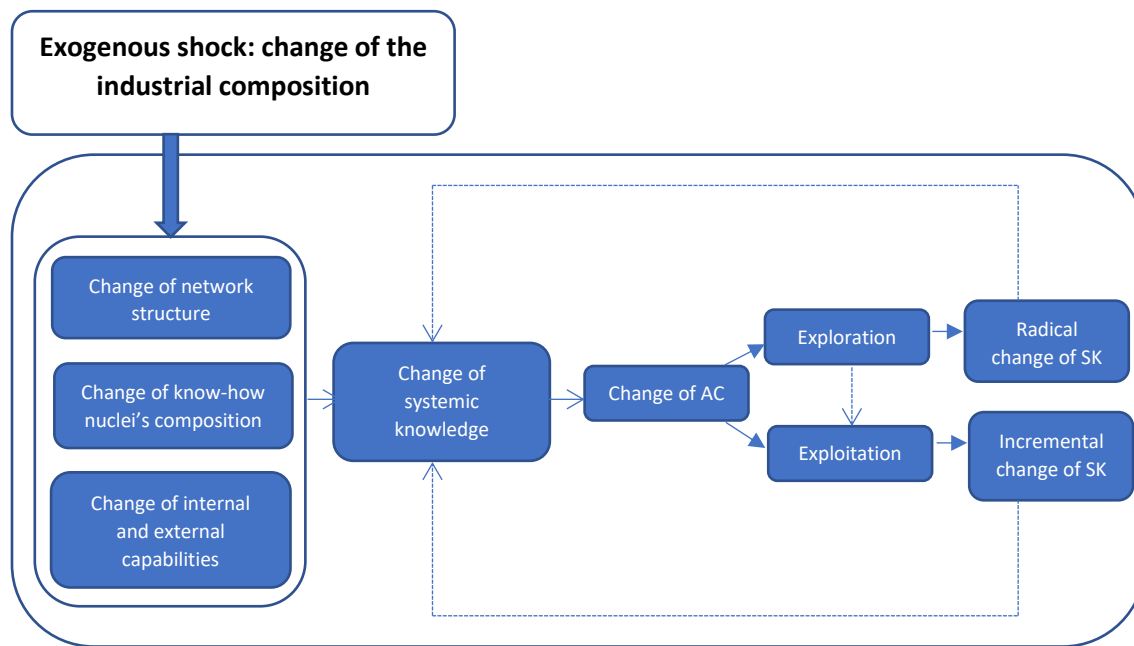


Figure 3 maps the evolutionary effects on the ID cognitive processes determined by the changes of the determinants of absorptive capacity, with a particular focus on the changes induced by international openness on the know-how nuclei’s composition. In this regard, we assume that the changes of the know-how nuclei’s composition are of four types:

- the loss/spawning of know-how nuclei and
- the contraction/expansion of know-how nuclei.

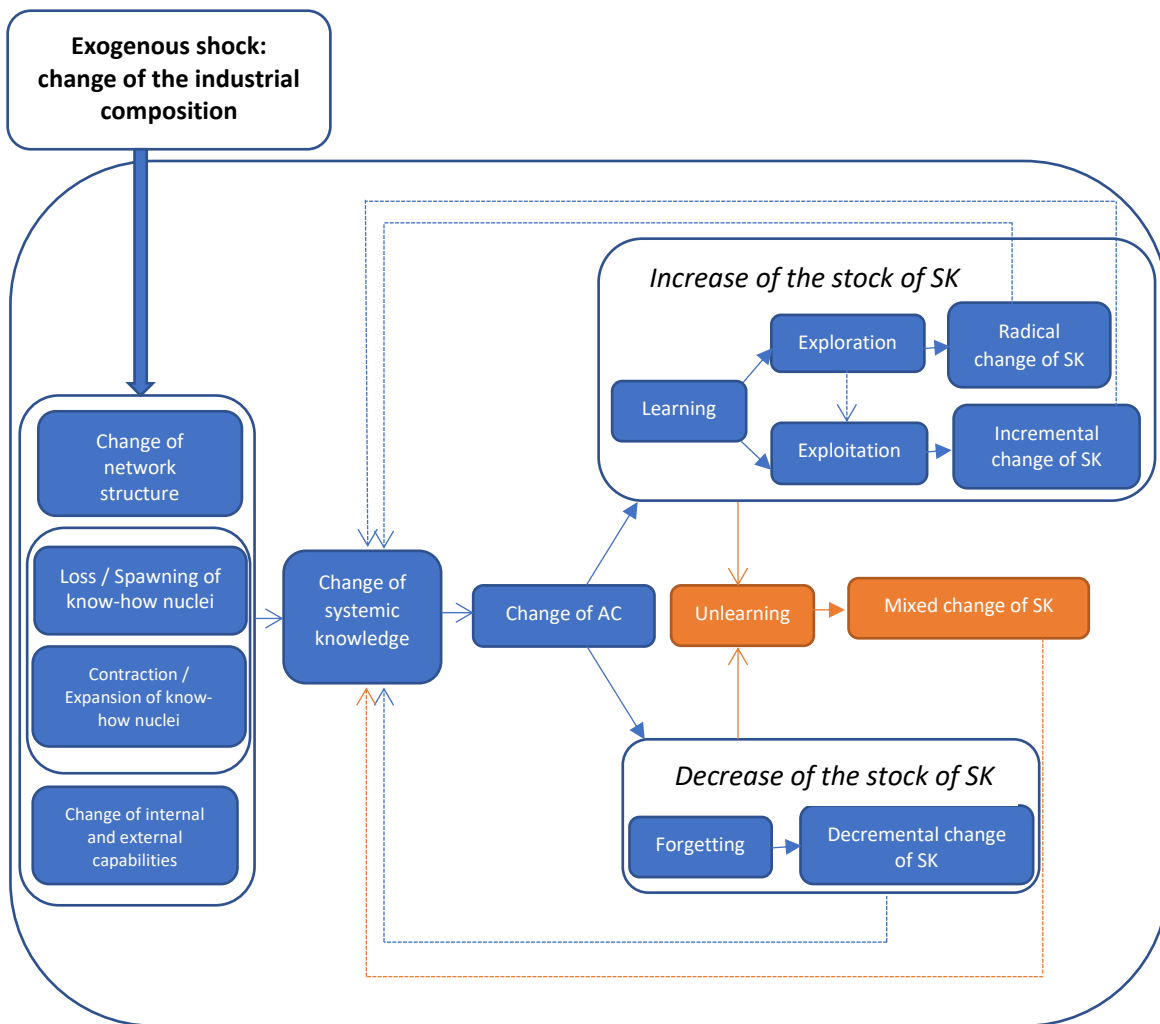
Recalling our previous description of the ID multiplicity, while the first category of effects (i.e. loss and spawning) refer to the number of nuclei in the system, the second category (i.e. contraction and expansion) describes the dimensional change of the know-how nuclei observed over the time. Specifically, on one side we observe the loss or creation (i.e. spawning) of know-how nuclei, whilst on the other side we have a contraction or expansion of existing know-how nuclei.

We further detect the endogenous cognitive processes triggered by each of the four effects considering them separately (no interactions) from the others. We associate the spawning of new know-how nuclei and the expansion of the existing know-how nuclei with explorative learning processes, where the former refers to the creation of new specializations within the core, while the latter alludes to explorative learning within one of the core's existing nuclei. Explorative learning paths lead to radical changes of the stock of systemic knowledge, either produced from the development of entirely new specializations or from new sources of knowledge generated in the existing nuclei. The expansion of existing know-how nuclei may nonetheless conduct to exploitative learning paths (for instance, when the new activities emerging in the nucleus possess a stock of technological knowledge that is strongly related to the stock already available in the nucleus), contributing to generate incremental variations of systemic knowledge.

The loss and contraction of know-how nuclei produce an inverse process of learning, which we refer to as a forgetting process. As argued before, we consider forgetting as a process which leads the ID core to a partial or integral depletion of specialized knowledge, as a consequence of the loss or contraction of know-how nuclei. In other terms, the changes of the industrial composition resulting from the disappearance of certain specializations (i.e. loss of know-how nuclei) and/or the dissipation of part of the specialized knowledge previously embedded into a specific nucleus (i.e. contraction of know-how nuclei), trigger forgetting processes generating a decremental change of the current stock of systemic knowledge.

The effects of learning and forgetting may though combine and generate unlearning processes. In this case, the stock of systemic knowledge is subject to the simultaneous increase and decrease of knowledge due to the learning and forgetting processes underway, which may reposition the ID into new paths of development. An overall unlearning effect can be observed in the Montebelluna sportswear ID (Sammarrà and Belussi, 2006), where the internationalization strategies undertaken by the ID firms in the Nineties to transfer labor-intensive manufacturing activities to low-cost countries (i.e. forgetting of specialized know-how), has paved the way to the improvement of those technological capabilities related to the activities of the main core (i.e. learning of new specialized know-how).

Figure 3: Absorptive capacity in industrial districts: dynamic framework (part b). Source: Author's elaboration.



5.1. Development paths from changes in the determinants of district absorptive capacity

In the previous Section, we have considered how the four changes of the know-how nuclei's composition induced by international openness affect the endogenous cognitive processes in IDs and thus generate specific variations of the stock of systemic knowledge. However, the idea that the four changes of the industrial composition occur one at a time, is a simplification of a much more complex reality. With this in mind, we now discuss about the possible interactions among them in order to develop a more comprehensive framework of the endogenous cognitive processes arising from the evolution of the know-how nuclei's composition.

Table 3 presents the structural changes expected from the interactions among the four

outcomes described before, taking into account the multiplicity of nuclei within the ID cognitive core. This is because the stock of specialized knowledge within the core of specialization is supposed to affect the most the accumulation of systemic knowledge, defining the trajectory of development of the system. To describe the possible changes within the ID cognitive core, we consider a simplified scenario based on the combination of two effects, one corresponding to a major effect that is dominant across the core's nuclei (that is, involving the highest number of firms), and the other one describing a minor effect that may occur in concomitance with the first one.

The main diagonal contains the individual changes of the industrial composition, as discussed in the previous Section. When the major change concerns the loss of know-how nuclei, the interactions with the other effects determines a condition of a) major reduction of the number of the ID core's nuclei with minor contraction of the other core's nuclei, b) major reduction of the number of the ID core's nuclei with minor spawning of new nuclei, c) major reduction of the number of the ID core's nuclei with minor expansion of current nuclei. The first scenario derives from the interaction between the major loss of certain nuclei in the ID core combined with a residual dispersion of specialized knowledge in the remaining nuclei resulting into the contraction of their dimension. In this context, the ID cognitive core may be experiencing a declining trend, which would potentially lead to the weakening and progressive dispersion of the ID production and socio-institutional structures. This trend could be overturned through interventions from private and public actors that favor the emergence of new knowledge sources (for instance, the introduction of a new technology or a new business strategy by a local firm which the others could imitate; the initiative of public institutions to encourage the innovative projects of local firms with funding opportunities or to train the workforce on more competitive business fields), leading to the second and third scenario of the framework. The second scenario concerns the loss of specializations within the ID core, and the simultaneous spawning of new specializations, though the second effect is still marginal with respect to the first one. The third scenario still considers loss as the main change of the industrial composition, though alluding at the same time to the expansion of some other specializations on the background.

When the contraction of the current nuclei in the ID core is the main change, its interactions with the other types of change produce a) major contraction of the ID core's nuclei with minor loss of other core's nuclei, b) major contraction of the ID core's nuclei with minor spawning of new nuclei, and c) major contraction of the ID core's nuclei with minor

expansion of current nuclei. In the three cases, we recognize the depletion of parts of specialized technological knowledge embedded into the nuclei as the most diffused change, moderated by a) residual loss of know-how nuclei (i.e. specializations) in the ID core, b) the spawning of new nuclei, and c) the expansion of some other existing nuclei in the ID core.

Whenever the major change of the industrial composition corresponds to the loss or contraction of the ID core's know-how nuclei, the system encounters a process of forgetting of systemic knowledge that results from the major loss or contraction of certain specializations within the local organization of production, describing an overall declining path of the ID. However, in some cases the declining path of the ID core is spotted with some processes of learning by exploiting in the existing nuclei and learning by exploring in the new nuclei, though the resulting unlearning effect is still too weak to support DIC-based learning processes (in this regard, see the Prato textile ID analyzed by Santini, 2016). Considering the spawning of new nuclei as the main change of the industrial composition, we observe three types of interactions corresponding to distinct development paths, a) major spawning of new nuclei with minor loss of other core's nuclei, b) major spawning of new nuclei with minor contraction of the ID core's nuclei, and c) major spawning of new nuclei with minor expansion of current nuclei in the ID core. In the first case, the ID core presents the development of new specializations and the residual loss of old specializations, depicting a substitutive effect between the old and the new that comes as the result of a process of unlearning. This is a scenario of radical change in the composition of know-how nuclei that can be though necessary for the system's recovery in times of crisis or severe decline of the main industry of specialization (see, for instance, the Montebelluna sportswear ID mentioned above). The substitutive effect between the spawning of new specializations and the impoverishment of old specializations can be less dramatic than in the case of loss, when it occurs with the minor contraction of the existing know-how nuclei. Explorative learning through the spawning of new nuclei goes with the expansion of the main industry of specialization in the third scenario, where we observe ongoing learning processes contributing to the accumulation of systemic knowledge in the new and the existing nuclei.

We now move to discuss about the expansion of the existing know-how nuclei as the main change, interacting with other minor changes to generate, a) major expansion of current nuclei with minor loss of other core's nuclei, b) major expansion of current nuclei with minor contraction of the ID core's nuclei, and c) major expansion of current nuclei with

minor spawning of new nuclei in the ID core. The main expansion of the current know-how nuclei implies a path of development of the ID core along the main sector of specialization, that may be associated with the loss of some specializations or the dispersion of bits of specialized knowledge (e.g. competences and skills), or supported by the spawning of new nuclei. In the third case, the expansion of the existing specializations and the spawning of new specializations on the background, can allude to a rapid path of growth of the ID core supported by the main industry. Menzel and Fornahl (2010: 226) describe this last scenario as the growing phase within the cluster life cycle, characterized by “the strong growth of existing companies and a high number of start-ups”, as observed with regard to the semiconductor industry in Silicon Valley in the Seventies.

Table 3: Major and minor effects of the endogenous cognitive processes on the ID cognitive frame. Source: Author’s elaboration.

Minor Effect Major Effect	Loss	Contraction	Spawning	Expansion
Loss	Major Reduction of the number of the ID core’s nuclei	Major Reduction of the number of the ID core’s nuclei with minor contraction of other core’s nuclei	Major Reduction of the number of the ID core’s nuclei with minor spawning of new nuclei	Major Reduction of the number of the ID core’s nuclei with minor expansion of current nuclei
Contraction	Major contraction of the ID core’s nuclei with minor loss of other core’s nuclei	Major contraction of the ID core’s nuclei	Major contraction of the ID core’s nuclei with minor spawning of new nuclei	Major contraction of the ID core’s nuclei with minor expansion of current nuclei
Spawning	Major spawning of new nuclei with minor loss of other core’s nuclei	Major spawning of new nuclei with minor contraction of the ID core’s nuclei	Major spawning of new nuclei in the ID core	Major spawning of new nuclei with minor expansion of current nuclei in the ID core
Expansion	Major expansion of current nuclei with minor loss of other core’s nuclei	Major expansion of current nuclei with minor contraction of the ID core’s nuclei	Major expansion of current nuclei with minor spawning of new nuclei in the ID core	Major expansion of current nuclei within the ID core

Single effect
 Unlearning with main decreasing variation of systemic knowledge (Loss or Contraction)
 Unlearning with main increasing variation of systemic knowledge (Spawning or Expansion)

6. Endogenous cognitive processes from the exploration of internal and external knowledge sources: a focus on district internationalization strategies

In this Section, we want to focus on the impact of ID international openness on the endogenous cognitive processes. Consistently with our prior discussion, internationalization is one of the factors affecting the determinants of ID absorptive capacity, firstly by modifying the know-how nuclei's composition, and then by impinging on the structure of local networks and on the set of ID internal and external capabilities. The ID establishes external relations through inward and outward internationalization strategies. The former concern the activities that foreign institutions and/or foreign-owned multinational enterprises (MNEs) address towards the ID, either by establishing collaborations and commercial agreements (e.g. licensing, subcontracting) with local agents (firms and institutions), or by realizing brownfield and greenfield investments in the territory. Outward internationalization strategies refer to the operations that local agents (firms and institutions) address to foreign markets through the same modes seen above with regard to inward internationalization.

The recognition of knowledge as a key competitive asset that increasingly represents the main objective of trans-local networks, highlights that the traditional motive of internationalization consisting in efficiency-seeking and market-seeking strategies, only partially reflects the operations that firms and institutions address to foreign markets. The reason why firms and institutions are involved in trans-local networks is more and more related to the resource endowment of the foreign context, specifically to the endowment of knowledge inputs. Combining our previous discussion about the ID absorptive capacity and the current discussion about the access to external knowledge inputs through trans-local networks, we argue that the impact of external knowledge inputs on the knowledge endowment of the ID, depends on:

- The degree of embeddedness (anchoring) of agents, firms and institutions, into the local (foreign) context;
- The quality of trans-local linkages in terms of direction and intensity of knowledge transfer;
- The absorptive capacity of the ID, referring to the capacity of exploring new knowledge inputs from external knowledge sources.

The rising interconnectedness among partners located in different places around the globe, has shifted the attention on how these relationships contribute to transfer knowledge inputs across different places, which we can define as “international centers of excellence for some specialized field” (Cantwell, 2009: 36). Despite the increasing integration of world economies, the creation of knowledge inputs is not a placeless phenomenon, as argued by Storper (2000), but rather it is strongly supported by the presence of specialized firms and dense institutional relations within local contexts, such as IDs and clusters. Given that knowledge is “sticky”, that is not replicable elsewhere, agents (firms and institutions) willing to explore external knowledge inputs, need to address their activities towards the foreign location and “anchor” knowledge dynamics in the new context (Crevoisier and Jeannerat, 2009). In this regard, Meyer et al. (2011) maintain that “multiple embeddedness” of MNEs represents a strategy to manage trans-local networks with the purpose to combine knowledge inputs from the domestic market, whilst tapping into external knowledge inputs from the embeddedness into foreign markets.

With regard to the knowledge-content of trans-local relations, we qualify the direction of knowledge transfer between the domestic and the foreign location, by distinguishing between knowledge-exploiting strategies and knowledge-seeking strategies, in accordance with Driffield and Love (2007), Kuemmerle (1999), Cantwell and Mudambi (2005), and Almeida and Phene (2004). Based on these contributions, we define knowledge-exploiting strategies in IDs as those operations addressed to foreign markets in order to exploit the existing knowledge stock available in the local context. For instance, knowledge-exploiting strategies may be referred to the establishment of production plants in the foreign market in order to adapt the firm’s products to the foreign demand. By contrast, knowledge-sourcing strategies aim at exploring knowledge inputs in the foreign context to augment the knowledge stock in the domestic market, for instance by investing in “hot spot” locations to access their technology.

Table 4 describes the conditions enabling inward and outward internationalization strategies to trigger knowledge creation processes inside the ID, affecting the system’s cognitive frame with the spawning and/or expansion of know-how nuclei. Inward internationalization positively affects the process of knowledge accumulation when it concerns knowledge-exploiting strategies of foreign agents (MNEs and institutions) endowed with superior technologies and anchored into the local system. By bringing new knowledge into the system, the anchored foreign agents contribute to expand the system’s multiplicity with the spawning of new know-how nuclei and/or the expansion of existing

know-how nuclei. Compatibly with the level of ID absorptive capacity, they participate into the endogenous process of knowledge creation and diffusion, enabling the transfer of new knowledge inputs into the system and their recombination with systemic knowledge (Ernst and Kim, 2002). Outward internationalization facilitates knowledge creation, whenever local firms and institutions explore knowledge inputs in foreign markets whilst remaining embedded into the ID context. These knowledge-seeking strategies “help the growth and variation of division of labor” (Bellandi and Caloffi, 2008: 517) and thus feed the local learning processes with new sources of knowledge⁷. The new sources of knowledge may develop in the field of the existing know-how nuclei determining the expansion of the related specializations, or they may correspond to radically new knowledge flowing into new know-how nuclei (i.e. spawning).

Table 4: Knowledge creation (spawning and/or expansion of nuclei) from inward and outward internationalization.

Inward Internationalization	Outward Internationalization
Knowledge-exploiting strategies	Knowledge-seeking strategies
Anchored in the local network	Embedded into the local network
District absorptive capacity	

In other circumstances, inward and outward internationalization determine the impoverishment of the local industrial composition, and thus of the multiplicity of know-how nuclei, triggering knowledge depletion through forgetting processes. This is the case of inward knowledge-exploiting strategies where the technological knowledge of the incoming firm (or institution) is not effectively shared throughout the system, either due to insufficient ID absorptive capacity or due to poor networking activities, increasing the knowledge gap between domestic and foreign agents. In this case, incoming firms (or institutions) exploit their superior technologies in the ID, replacing local agents in the execution of specific activities. This causes the loss and/or contraction of know-how nuclei within the ID core, leading the system to forget the correspondent bits of specialized knowledge. In this regard, we observe, for instance, the functional downgrading of the firms

⁷ Bellandi and Caloffi (2008) identify four types of international productive strategies undertaken by district firms – lonely trader, multinational, enclave, cluster-to-cluster – and two outcomes on the local division of labor generated by the same strategies: delocalization and relocalization.

in the Riviera del Brenta footwear ID due to the expansion of the top luxury brands in the territory. This condition has increased the dependence of local firms on the subcontracting relations with the luxury brands, whilst reducing their ability to independently perform marketing and distribution activities (Rabellotti, 2004).

According to Bellandi and Caloffi (2008), outward internationalization strategies determine the loss of industrial or trade activities previously embedded in the ID as a consequence of those firms' strategies (i.e. lonely trader, multinational) to outsource abroad specific activities without the involvement of partners or institutions. This leads to a partial or integral loss of specializations in the ID core, reflecting a reduction in the dimension of the existing know-how nuclei or the entire loss of them. The Barletta footwear ID described by Amighini and Rabellotti (2006) is an example of how local firms' delocalization strategies have wiped out the network of local subcontractors, triggering extensive forgetting processes of systemic knowledge and reducing the chances for the system's recovery.

7. Conclusions

In this Chapter, we have analyzed how external linkages affect the endogenous cognitive processes in IDs, determining the system's development path. Among the possible external factors that may imping on the ID cognitive frame (e.g. new technologies, policy interventions, macroeconomic trend), we have specifically considered the internationalization strategies undertaken by local actors (firms and institutions) towards foreign markets (outward internationalization), and those by foreign actors addressing their activities inside the ID (inward internationalization).

The ID capacity to start local experimental processes from the transformation of internal and external knowledge inputs depends on its level of absorptive capacity, defined by the stock of knowledge embedded into the know-how nuclei's composition, the structure of local networks and the set of internal and external capabilities enabling DIC-based learning processes. In the proposed conceptual framework, we observe how external linkages affect one of the determinants of ID absorptive capacity, namely the know-how nuclei's composition, assuming that this condition will then call upon the adaptation of the institutional frame, described by the structure of local networks and the set of ID internal and external capabilities.

By modifying the composition of know-how nuclei, the openness of IDs to external relations trigger different endogenous cognitive processes leading to a correspondent modification of the stock of systemic knowledge. External relations supporting the

expansion of the existing nuclei or the spawning of new nuclei, improve DIC-based learning processes, determining an increase of the stock of systemic knowledge. However, the multiplicity of nuclei can also be impoverished by external relations through the loss or contraction of the nuclei, triggering a process of forgetting of systemic knowledge. The two effects can also combine into an unlearning process, referred to the transformation of the stock of systemic knowledge as a consequence of knowledge accumulation and depletion, that may open up to new paths of development.

In the following Chapters, we are going to support our conceptual framework with further empirical evidence. In the first place, we will analyze through a quantitative model how the different outward internationalization strategies impact on the process of knowledge creation and depletion in IDs, which are expected to support and constrain, respectively, the innovative performance of ID firms. Secondly, we consider the case of the Macerata-Fermo footwear IDs to explore how inward and outward internationalization is determining structural changes within the local systems, triggering the endogenous cognitive processes described in the conceptual framework.

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Measuring the Effects of Internationalization on the Cognitive Structure of Industrial Districts (IDs): A Focus on the Innovation Strategies of ID Firms

Abstract

The Chapter analyzes how the type of internationalization undertaken by the mass of firms in the region, affects the innovation strategies of the ID firms located in the same territory. We identify the type of internationalization strategies by the effect they generate on the local endowment of knowledge. Knowledge seeking strategies are supposed to bring new knowledge inputs into the system, while knowledge exploiting strategies may be detrimental to the localized stock of knowledge when they determine a substitution effect of local activities. By modifying the system's endowment of knowledge, international openness can either support or constrain the emergence of external economies of learning, affecting the innovative performance of ID firms. Results from the empirical analysis based on 2008 and 2015 MET survey data, highlight that knowledge seeking internationalization increases the probability of an ID firm to become Complete Innovators (i.e. doing Product, Process and Organizational Innovation, and involved in product design and R&D activities) over time. Conversely, knowledge exploiting internationalization is related with two different patterns of innovation. In the first place, it encourages firms to accumulate competences in process management, increasing the probability of becoming a Process Innovator. On the other hand, it decreases the probability of becoming a Complete Innovator, highlighting potentially weakened learning processes due to a substitution effect with local business networks.

Keywords: Knowledge; Innovation; Knowledge-seeking strategies; Knowledge-exploiting strategies

1. Introduction

In the last decades, we have witnessed an increasing integration of worldwide markets, favoured by globalization and easier transport and communication services. Firms in industrial districts (IDs) have not been exempted from this trend, in fact they have expanded their network at the global level, sometimes reducing the density of relationships with other firms and institutions in their home market. Far from the view of IDs as self-contained systems (Becattini and Rullani, 1996), scholars have devoted their attention to understand the structural transformations undergoing in these systems historically endowed with strong

local roots. Although the establishment of channels toward foreign markets brings a bundle of economic advantages for the firm, as extensively discussed in the international business literature, the systemic effects of international openness on IDs may be controversial. On one side, the global expansion of ID firms' network may favour the repositioning of the system on more competitive paths of development. On the other side, however, it may determine the erosion of the local industrial base which could affect the opportunity for ID firms to benefit from local external economies.

The purpose of this research is to analyse the effects of ID firms' internationalization strategies on those systemic conditions which favour the emergence of external economies of learning and innovation. As discussed in the first Chapter, internationalization strategies modify the industrial composition of IDs, comprising firms into the main industry of specialisation and firms into the other industries, and also the institutional network relating them through strong and weak ties (Granovetter, 1983). In this way, they interact with both the endowment of specialised knowledge and the structure of relations enabling knowledge redistribution, which are at the heart of ID endogenous cognitive processes. This is because all ID firms represent a fragment of specialised know-how, which can be transmitted to the other firms, due to the ease of communication characterising ID networks.

The emergence of external economies of learning throughout the system, is a key determinant of competitiveness for ID firms, as it usually leads them to outpace not-ID firms in terms of innovative performance. If it is true that internationalization represents an opportunity to capture external knowledge inputs and to trigger learning processes inside the system, it may also be detrimental for the system's industrial base, generating the loss of parts of the specialised know-how through a process of forgetting and thus limiting the chances for firms to benefit from local knowledge inputs. By taking into account a broad spectrum of internationalization strategies, regarding sales, production and other types of economic activities, the analysis contributes to the existing literature by identifying the diverse implications of international openness for local systems, and specifically for localised learning processes. Furthermore, the analysis highlights that internationalization can be a factor that may potentially trigger forgetting processes in the system and undermine the emergence of knowledge external economies, which is a rarely explored issue in the literature.

We approach the research question from a theoretical and empirical perspective. Based on the conceptual framework described in the first Chapter, in Section 2 we recall the theoretical foundations regarding the endogenous cognitive processes in IDs and how they

affect the innovative performance of ID firms. Section 3 is dedicated to explore the main issues underway in the literature about the participation of IDs into international networks of production and its implications for the “local determinants of competitiveness” (Bellandi and De Propriis, 2015). Section 4 highlights the heterogeneous effects on the stock of specialised knowledge (and thus on the innovative capacity of ID firms) expected from different strategies of internationalization. In Section 5, we present an econometric model that analyses the assumptions emerging from the theoretical background. Specifically, strategies of internationalization bringing knowledge inside the ID (i.e. *knowledge seeking strategies*) trigger learning effects supporting the innovative performance of ID firms. Conversely, strategies of internationalization devoted to exploit the firm’s technological knowledge on foreign markets (i.e. *knowledge exploiting strategies*) may either favour learning processes when they represent an expansion of the current business and they contribute to attract new external knowledge inputs, or they may deprive the system from specialised knowledge with negative implications for the innovative performance of ID firms.

2. Endogenous Cognitive Processes and Innovative Capacity in IDs

In the late Seventies, IDs have come to the fore as a form of industrial organization that was primarily composed of a highly interconnected group of small producers, which could compete altogether with the economies of scale of the large, vertically integrated firm. The success of the ID derives from a mixture of economic, socio-cultural, and institutional factors that combine and affect each other. In accordance with Becattini (1990)⁸, it is not only the industrial dimension (i.e. firms) that determines the competitiveness and thus the reproducibility of the ID economic success over the time, but also the embeddedness of producers into local social networks based on mutual trust and loyalty.

Conceived as one of the main resources of economic growth (Boschma and Lambooy, 2002), the stock of systemic knowledge in IDs represents the rich endowment of industry-specific technological knowledge, deriving from the set of information, specialised skills, competences and know-hows embedded into the ID socio-cultural and institutional context. Since knowledge creation results from a place-specific and cumulative process, the stock of systemic knowledge expresses the history of knowledge accumulation inside the ID and

⁸ “I define the industrial district as a socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area, where community and firms tend to merge” (Becattini, 1990)

also contributes to define the future development path of the system (Antonelli, 2008). For systemic knowledge to be adjusted over the time, we need to consider the systemic conditions enabling knowledge accumulation, namely the endowment of specialised, technological knowledge and the structure of local networks across ID firms, institutions and the local community, supporting knowledge diffusion and recombination.

The ID is usually identified by its main industry of specialisation, which contributes the most to the accumulation of systemic knowledge. However, in addition to the ID production core, composed of the multitude of firms within the same *filière*, the other industries of the system represent a source of variety in terms of knowledge sources, which is external to the ID core, but internal to the ID. Although the relationships among firms within the core are inevitably more frequent and stable due to the interdependencies within the same business field, the presence of other industries in the local society enables cross-sectoral exchanges of information and knowledge that trigger new local experimental processes and the further accumulation of systemic knowledge.

A plethora of studies on IDs and clusters emphasizes the economic advantages (usually referred to as external economies) arising from the participation of the firms into a stable and dense network of relationships. This is particularly true for IDs, where local networks emerge within a bounded geographical space where both professional and private life take place, facilitating the establishment of durable, trust-based relationships. In this research, we focus on the contribution of specialised, technological knowledge embedded into local networks to fuelling a continuous stream of knowledge and ideas, supporting the innovative efforts of local producers.

The multiplicity of knowledge sources, within the ID core and in the rest of the local society, and the social interaction within local networks support the innovative efforts of local producers by fuelling external economies of *decentralized industrial creativity* (DIC) (Bellandi, 2009). This corresponds to the novelty generated in the system by the joint participation of a large group of producers, who share their specialised practises through frequent interactions contributing to build up new systemic knowledge or new combinations of existing knowledge. By means of DIC-based processes, firms develop new skills and competencies, increasing their capacities of adaptation and customisation which can be expressed through the introduction of innovations in products, processes, and organizations (Bellandi, 2002).

A structural shock regarding the organization of production, such as the one determined by the internationalization of the supply chain, questions the capacity of the system to

undertake further virtuous knowledge accumulation. This is because the establishment of external linkages through international openness may either increase or decrease the set of specialised, technological knowledge that support DIC-based external economies. In the first case, internationalization contributes to enrich the system's industrial configuration with new specialised skills and competencies, favouring learning processes in existing or in emerging business fields. However, whenever the process of internationalization reduces the number of firms in the ID, the system experiences a loss of specialised know-how leading to a process of forgetting of systemic knowledge. In this condition, the chances for ID firms to benefit from DIC-based external economies, are weakened generating negative implications for the average innovative performance of ID firms.

3. The Good and the Bad of ID international openness

The global expansion of production networks is based on the idea that the process of value creation can be unpacked in stages composing a certain value chain, and that each of these stages can be physically distant from the rest of the chain without affecting its efficiency. This implies the possibility to separate tangible (i.e. production) and intangible activities (i.e. product development, marketing, and distribution) giving the firm the chance to benefit from a set of country-related economic advantages and to improve its level of competitiveness (Buciuni and Finotto, 2016).

According to Rabellotti et al. (2009) and Menghinello (2004), the internationalization of IDs has been historically related to their export performance, describing a common strategy across ID firms "to produce locally to sell globally" (De Propris et al., 2008: 500). Starting from the Nineties, however, the challenges of globalization and fierce international competition (especially from emerging economies) led firms belonging to older IDs in advanced economies (such as, Italy) to seek new sources of competitive advantage outside of the local system, first by dismantling replicable and standardized tasks that were reproduced in low-cost economies for improving cost efficiency, and then by pouring on foreign markets in search of commercial opportunities and specific competencies. The international openness of IDs has fuelled a lively debate on their capacity to renew the local determinants of competitiveness, and to reaffirm the ID as a sustainable model of local development (Bellandi and De Propris, 2015). On one side, the participation into global networks has become a *not disputandum* condition for local firms, as it enables them to access an array of advantages including the opportunity to acquire new resources, such as

knowledge, to lower production costs and to access growing markets (De Propris et al., 2008; Ernst and Kim, 2002). On the other side, the international fragmentation of the value chain implies a reconfiguration of the ID internal structures, particularly with regard to the endowment of specialised knowledge, and the web of complex interdependencies involving firms and institutions. This raises the attention on the preservation of the internal mechanisms that allow for knowledge creation, absorption, diffusion, and retention, as it could be the presence of diverse fields of specialised knowledge, and of a high-quality local “buzz” favouring the circulation of knowledge through direct and spontaneous interactions (Storper and Venables, 2004).

For quite a long time, it has been argued that the relocation of low-cost production activities enables home economies to upgrade their industries by focusing on higher value-added functions and by establishing a competition based on high-quality and innovative products and services⁹. More recently, however, a different view has been proposed on the effects of manufacturing internationalization for the capacity of the home economy to retain strategic competencies, accumulate knowledge, and sustain the innovation capacity of local firms. In 2009, Pisano and Shih write about decreasing US trade balance in high-technology products turning into negative figures from 2002, worsened by flat average real weekly wages in the US since 1980. The reason for this alarming trend should lie upon the decision of US companies to outsource abroad development and manufacturing activities, in order to dismiss lower value-added tasks and to free resources for core competences and innovation. This has led though to a leakage of know-how and competencies, limiting the opportunities to achieve innovative solutions. Related to this, Bailey and De Propris (2014) argue that the internationalization of production activities has hollowed out many manufacturing sectors in the home economy, eroding the labour market and thus the stock of specialised competencies. Together with other constraints, such as the limits to the availability of finance, this loss of skills prevents firms to bring back (i.e. *reshoring*) high value-added manufacturing activities, especially with regard to highly customised products that require the colocation of production and innovation.

Buciuni, Coro’ and Micelli (2013) support the line of Pisano and Shih by providing empirical evidence on the furniture industry in North Carolina (USA) and in Northeast Italy. They argue that direct control over manufacturing processes is fundamental for those firms whose competitive advantage stands from product design, customization and short

⁹ For a recent review of case studies, see Belussi and De Propris (2014)

lead times. Drawing on a multiple case study on three Italian low-tech industries (furniture, leather and bicycle production), Buciuni and Finotto (2016) find out that product innovation depends on a bundle of development functions requiring specific manufacturing competencies. Therefore, the authors conclude that the outsourcing of production does not affect the innovative capabilities of traditional manufacturing regions, as long as the region keeps the control over this bundle of manufacturing activities related to product development.

In sum, the analysis of the long-term impact of international openness on home economies (in our case, IDs) is still an open debate. At a first glance, the delocalization of some manufacturing activities (especially, the most standardized ones to low-cost countries) seems to be necessary to reposition the local economy to higher value-added, skill-intensive activities. However, the costs of this event for the IDs production organization are usually high in terms of the number of firms and of the specialised know-hows lost with regard to those activities now outsourced abroad, reducing the stock of systemic knowledge and limiting the ID innovative capacity based on DIC-processes. Therefore, behind the participation of IDs firms into global networks of production organization it may hide either the opportunity for the system to reconvert itself into more competitive activities, or the threat of disintegration due to excessive reliance on foreign production.

4. Strategies of Internationalization in IDs and Expected Impact on Systemic Knowledge

The internationalization strategies of IDs can take different forms, in terms of both the level of commitment dedicated to the foreign market (Johanson and Vahlne, 1990), and of the subjects involved in the process of international openness (Bellandi and Caloffi, 2008). Identifying the different structures through which IDs go abroad, is fundamental to understand to what extent and in what direction the access to foreign markets generates flows of ideas and information that can affect the stock of systemic knowledge inside the ID. The variations observed on the endowment of specialized know-how is a key point in our discussion as it represents the set of opportunities where firms can grasp ideas leading to the introduction of innovations.

Regarding the modalities of internationalization, Tattara (2009) argues that there are several channels through which ID firms establish relations with foreign markets: trade flows (imports and exports); sub-contracting; commercial and/or technological agreements; and direct investments abroad. It is widely agreed in the literature that among these

channels, the most frequently undertaken by ID firms are those representing “soft” forms of internationalization, such as sub-contracting and informal agreements (Tattara, 2009; Canello, 2016). This is because the average small size of ID firms limits the availability of managerial, organizational and financial resources that are necessary to invest in the establishment of foreign production plants, to bear the sunk costs connected with the decision to invest abroad, and to coordinate a global network including activities in different countries (Rabellotti et al., 2009). Therefore, small and medium-sized firms usually opt for less risky and more flexible solutions, such as the outsourcing of certain manufacturing activities to foreign sub-contractors through non-equity agreements, having as object the production and/or distribution of the lead firm’s products. A long-term strategy, such as the decision of engaging in FDIs, is preferred with large volumes of production, when the firm needs to maintain the control of certain strategic functions through a hierarchical organization, and when the country of investment represents a favorable environment to invest in, for instance due to easy financial regulations (Tattara, 2009).

Focusing on the internationalization of IDs, Canello (2016) describes the characteristics of IDs as open networks, and argues that the decision of ID firms to move some manufacturing activities abroad is “often the result of a collective decision taken by groups of local firms, which jointly select a suitable geographical location for their foreign activities and define the timing to locate production abroad” (Canello, 2016: 4). Related to this, Bellandi and Caloffi (2008) identify four types of internationalization configurations and strategies, which we can distinguish on the basis of the subjects belonging to the homeland ID involved in the process of international openness: a) the lonely trader strategy, involving single district firms interested in finding market opportunities in the foreign location without any institutional support or long-term plans; b) the multinational strategy, when firms establish their activities abroad without the support of homeland institutions to catch the economic opportunities in the destination area¹⁰; c) the enclave strategy, characterized by teams of ID firms investing abroad in coordination with the ID institutional support, but without long-term commitment to foreign partners; d) cluster-to-cluster strategy, “where agents rooted in (at least) a couple of clusters (and related localities) are jointly involved in institutional and productive investments and exchanges between the same clusters (and

¹⁰ The authors specify that in some cases multinational firms collaborate with foreign institutions to “anchor” their investments in the destination locality.

localities)” (Bellandi and Caloffi, 2008: 524). The four configurations describing the type of internationalization undertaken by ID actors, are supposed to have different implications for the production structure of the ID: delocalization strategies (a; b) reduce the system’s industrial base by moving one or more activities abroad without the long-term involvement of external partners from the homeland ID (firms and institutions); relocalization strategies (b; c; d) based on the collaboration between firms and institutions from the homeland ID, may contribute instead to the transformation of the ID production structure, determining the loss of those activities moved abroad, but favoring at the same time the emergence of new specializations.

As discussed in the previous Sections, the innovative capacity of ID firms is strictly connected with the opportunities to access new ideas emerging from the continuous recombination of the specialised know-how of every ID producer. Considering the new context where the ID firms operate, that is an open network integrating both local and global relations, a question arises on the implications of external relations between ID agents (firms, institutions, and people) and outside partners for the endogenous process of knowledge creation and thus for the innovative capacity of ID firms.

Some authors recognize that the involvement of local systems, such as IDs and clusters, into global pipelines may contribute to bring novel ideas and information inside the local networks, triggering new localised learning processes (Bathelt et al., 2004; Morrison et al., 2013). In this regard, Chiarvesio et al. (2010) emphasize the beneficial contribution of the new pieces of information and knowledge coming from the outside to renovate the knowledge base of the ID “open network firms” and to boost their innovation capacity. This perspective is at the crossroads between recent contributions from the global value chains (GVCs) approach and from innovation studies, where it is emphasized that the international opening of local firms not only offers them wider opportunity for efficiency-seeking and market-seeking strategies, but it also facilitates their access to international knowledge sources (De Marchi et al., 2014; Liu and Chaminade, 2014).

However, the international openness of IDs raises concerns on the preservation of the ID internal structures (e.g. De Marchi and Grandinetti, 2014), particularly with regard to the industrial configuration endowed with specialized, technological knowledge, and the institutional context supporting relationships among firms, institutions and the local society, that are essential to trigger local processes of knowledge creation. For instance, the absorption of external knowledge inputs may increase the gap between firms with higher absorptive capacity and smaller producers who become more and more dependent on the

economic power of the leader firms (Belussi and Sedita, 2012), undermining a process of knowledge generation based on DIC that is typical of heterarchic local production systems (such as, IDs). Furthermore, the delocalisation of production activities may have a detrimental impact on the local subcontracting network, leading the system to forget specialised skills, competence and know-how and thus reducing the system's innovative capabilities based on DIC-processes. This condition has led traditional IDs, such as the Barletta footwear ID, to a path of long-lasting crisis (Amighini and Rabellotti, 2006).

Drawing upon our discussion about the effects of international openness on systemic knowledge, we introduce the main hypotheses supporting our empirical investigation. In this research, we analyse whether the internationalization strategies of the firms in the system are sustaining the innovative performance of ID firms by bringing external knowledge inputs that trigger DIC-based learning processes. Conversely, if internationalization strategies undermine the system's industrial configuration, leading to the loss of specialised, technological knowledge, we expect a detrimental effect on the innovative capacity of ID firms, due to weakened DIC-based processes. To investigate these relations between international openness and the structural conditions supporting the innovative capacity of ID firms, we need first to characterise the internationalization strategies by the direction and intensity of knowledge transfer, and then to consider a set of other control variables (i.e. the system's absorptive capacity and level of specialisation/diversity, other firm-level control variables) that may be impinging on the innovation strategies of ID firms.

4.1. Knowledge-Seeking and Knowledge-Exploiting Internationalization Strategies

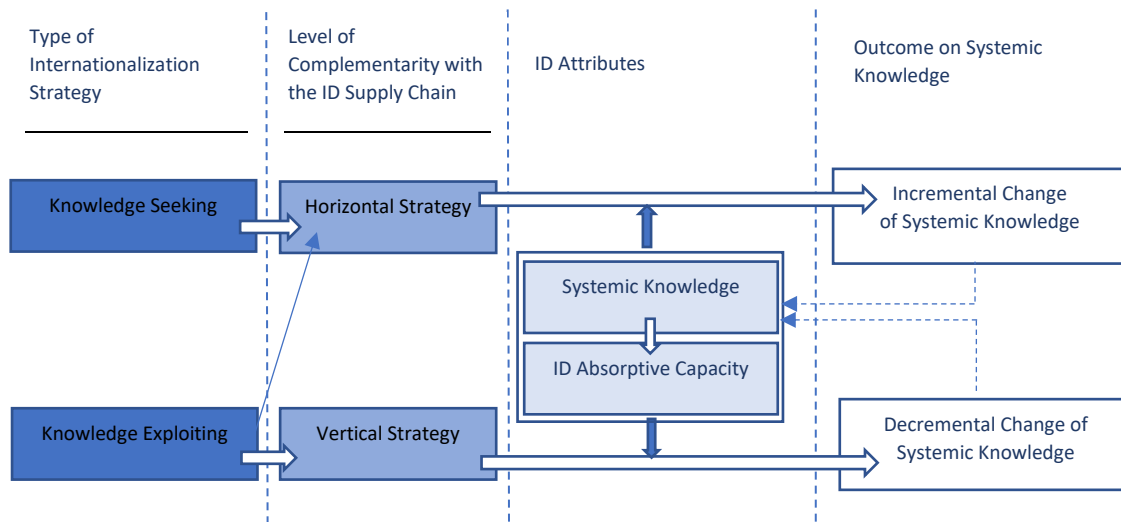
A deeper investigation of the internationalization strategies undertaken by ID firms, with regard to both the modality to access foreign markets and the involvement of one or more actors in the process, lays the foundations for understanding the learning opportunities that firms have by participating in global networks of production. In order to assess how the firm's presence on foreign markets is related to its knowledge base, and how this may affect systemic knowledge, we need to characterise the firm's internationalization strategy in relation to its knowledge-intensity and to the direction of knowledge transfer between the domestic and the foreign market. To this end, we use the distinction between *knowledge exploiting* and *knowledge seeking* internationalization strategies introduced in the first

Chapter (Driffield et al., 2010)¹¹. By combining this qualification and the attributes of IDs which are conducive to knowledge creation (e.g. absorptive capacity), we can assess how firm-level decisions to internationalize trigger learning (or forgetting) opportunities for the system as a whole, affecting the average innovative performance of local firms.

Briefly recalling the main points of the theoretical scheme discussed in the first Chapter and re-proposed in Figure 1, we expect learning opportunities for the firm and for the ID in case of knowledge seeking strategies, whereby ID firms expand their current business by establishing external connections to access new sources of knowledge in foreign markets (i.e. horizontal internationalization), and the absorptive capacity of the ID is adequate to exploit and diffuse external knowledge inputs throughout the system. In accordance with this framework, knowledge seeking strategies are assumed to be horizontal with respect to the ID supply chain, as they refer to firms having access, through internationalization, to new sources of knowledge that would not be available inside the system. Conversely, the implications of knowledge exploiting strategies, referred to firms exploiting their existing technological knowledge on foreign markets to increase value added and profits (Le Bas and Sierra, 2002), are less straightforward. Knowledge exploiting strategies can be either horizontal or vertical with respect to the ID supply chain. In the first case, ID firms expand their business by investing in foreign locations where they can exploit their technological knowledge, without harming though the activities realised inside the ID, but rather contributing to their expansion through the knowledge gained from their international experience. In the second case, vertical knowledge exploiting strategies toward foreign markets determine a substitution of local manufacturing activities, with negative consequences on the domestic industrial base and thus on the stock of systemic knowledge.

¹¹ By considering the internationalization strategies of ID firms and the effects that these may have on the innovative capacity of IDs, we are limiting our analysis to the outward internationalization channels between ID and the foreign markets.

Figure 1: Outward internationalization strategies and expected variations of systemic knowledge. Source: author's elaboration.



The key distinction between knowledge seeking and knowledge exploiting strategies derives from their implications for the stock of systemic knowledge, that is, whether they contribute to increase or decrease the set of specialized skills, competences and know-how in the system.

According to our conceptual framework, knowledge seeking internationalization triggers DIC-based learning effects in the system and thus we expect that it positively affects the innovative capacity of local firms. In our analysis, we assume as proxies of knowledge seeking strategies:

- a) direct exports, enabling firms to acquire competences related to the search for new foreign buyers, and to manage marketing and distribution channels as a consequence of “learning-by-exporting” (Gereffi, 1999; Humphrey and Schmitz, 2002),
- b) other commercial activities abroad (e.g. participation in international fairs), whereby firms are involved in exchanges of information and dense face-to-face interactions, defined by Schuldt and Bathelt (2011) as “global buzz”, that increase knowledge about foreign markets, improve networking activities, and generate new ideas, especially on product design,
- c) commercial agreements with foreign partners, allowing firms to access specific competencies and resources that are concentrated in the foreign context, such as knowledge about technologies, organizational management and market structure (Gertler and Levitte, 2005; Sammarra and Biggiero, 2008), and

- d) Research programs and technology exchanges with foreign partners (Cantwell and Santangelo, 2000).

By contrast, knowledge exploiting internationalization aims at using the existing resources in foreign markets, generating either a beneficial effect on localized learning processes when it expands local business, or it can be detrimental for systemic knowledge when it determines the loss of specialized skills, competences and know-how. If the second rationale prevails over the first one, the internationalization through knowledge exploiting strategies should negatively affect the innovative performance of local firms as they can benefit from a reduced base of systemic knowledge hampering DIC-based external economies. We associate to knowledge exploiting strategies:

- a) partial or total delocalization of production, representing the most common strategy of production internationalization in IDs specialized in traditional industries (e.g. textile, garment, footwear), and usually referred to the transfer abroad of labor-intensive manufacturing activities with the purpose to increase production efficiency and to seek specialized workforce in foreign countries,
- b) production joint ventures abroad, requiring a specific, long-term commitment of the partners to realize “functional synergies” (especially, in production activities) by sharing resources, skills and competences (Nassimbeni, 1998), and
- c) foreign direct investments (FDIs), based on the idea that multinational activity requires advanced organizational, managerial and financial resources to control an international production network and to bear the costs of FDIs (Rabellotti et al., 2009).

In order to observe whether internationalization strategies are either supporting or constraining the average innovative performance of ID firms by triggering, respectively, DIC-based learning processes and forgetting processes on the stock of systemic knowledge, we need to consider the aggregate amount of international activities in the system. This is because we expect that internationalization strategies are more disruptive for the system’s industrial configuration, when they are undertaken by a critical mass of local firms.

4.2. Other control variables

A number of other factors is expected to impinge on the relation between the system’s international openness and the innovative capacity of ID firms. In this regard, we need to

consider both the systemic conditions that are supposed to affect the innovation capacity of local firms through the emergence of knowledge external economies, and the firm-level attributes that we deem as fundamental to explain the firm's knowledge-processing systems¹².

As discussed in the previous Sections, ID firms gain a competitive advantage with respect to not-ID firms by being embedded into local networks endowed with specialised, technological knowledge. In this way, they have access to knowledge inputs, such as specialised skills, competences and know-how, that are available to ID firms, but not to firms located outside of the system. However, for the system to act as a vehicle of knowledge assimilation and diffusion, and to be a source of knowledge external economies, a certain level of absorptive capacity is required, standing for the system's capacity to assimilate and transform external knowledge inputs (Cohen and Levinthal, 1990). In addition to describing the system's ability to manage knowledge resources, the capacity to absorb external knowledge inputs is key for renovating the learning processes in IDs, and thus for boosting the innovative activity of local firms.

Drawing upon the wide literature on absorptive capacity (Van den Bosch et al., 1999; Kogut and Zander, 1992; Lewin et al., 2011), the configuration of systemic knowledge and the structure of local networks represents the main determinants of the system's absorptive capacity. Systemic knowledge refers to the endowment of formal and practical knowledge (Becattini, 2004), that the system has accumulated in a path-dependent way through its socio-cultural and institutional frame. Based on the stock of systemic knowledge, the system enacts DIC-based processes leading to the emergence of knowledge external economies which support the innovative performance of local firms. In this context, the endowment of multiple sources of specialised, technological knowledge, including the ID production core and the other industries of the system, represents a source of diversification among the system's knowledge inputs, triggering new local experimental processes and supporting the innovative performance of ID firms. The network structure determines the ease of knowledge diffusion within the system. Being it embedded into a specific institutional frame, made up of the norms, conventions, and explicit rules governing local relations, interactions among local agents are facilitated, supporting the exchange of knowledge inputs. In line with these arguments, we will include in the model two variables

¹² Lane and Lubatkin (1998: p. 464) argue that knowledge-processing systems "establish the ground rules for how knowledge is acquired, stored, and transferred."

having the purpose to describe the multiplicity of knowledge sources in the system through a measure of industrial concentration (i.e. the Herfindahl Index), and to account for stable network relationships in the system through a measure of the density of business relations among local firms.

Not only do systemic conditions affect the innovative performance of ID firms, but also the characteristics of the single firm we are considering. In this regard, we refer to firm-level absorptive capacity as to those conditions that are “not only related to discovery but also to learning and acquisition of knowledge and skills, to the retention of knowledge and to tangible investments that constitute a technical infrastructure for further technological development” (Caloghirou et al., 2004: 31). While it is common to operationalize absorptive capacity through R&D expenditures (Todorova and Durisin, 2008), this measure does not fully capture the range of processes that increase the firm’s ability to absorb external knowledge inputs (Zahra and George, 2002). The use of R&D as a measure of absorptive capacity would be even more misleading for ID firms usually specialised in traditional sectors, whose innovations are rarely based on R&D efforts. For this reason, based on Caloghirou et al. (2004) and Minbaeva et al. (2003), we consider tangible investments in material fixed assets (e.g. lands, plants and equipment, machinery) and intangible investments in other immaterial assets (e.g. training of the workforce, marketing activities, software improvement) as a factor that supports the firm’s absorptive capacity and innovation capacity.

5. Methodology

As seen in the previous discussion, the internationalization strategies pursued by the ID firms affect the stock of systemic knowledge, corresponding to the set of specialised know-hows mastered by the firms within the core industry and in the other industries of the system. In other terms, the outcome of the endogenous cognitive process triggered by international openness (i.e. learning or forgetting) may either support or constrain the basis for potential exchanges of ideas and information through DIC-based external economies, which has always been identified as one of the main sources of innovation for ID firms.

The empirical analysis of the relation between internationalization and innovative capacity of ID firms, implies a number of methodological issue. In the first place, the collection of data requires our attention with regard to the territorial dimension to be considered. It is common to associate the ID to an organization which extends over a bounded territory,

generally not well identified by administrative boundaries. To date, the most fruitful effort to map IDs in Italy, derives from the Local Labour Market Areas (LLMAs) adopted in ISTAT classifications, which take into account the travel-to-work areas to describe the overlap of private and professional relations, as typically recognized in the ID model (Sforzi, 1990). Due to data constraints at the level of LLMAs, we need to use data on a different geographical scale, corresponding to the NUTS-2 region where the ID firm is located. Italian NUTS-2 regions are headed by public regional governments and comprise a set of business and institutional actors (firms, municipalities, provinces, and others) and the relationships among them. Within the Italian NUTS-2 regions we can map multiple local systems according to the classification of LLMAs. Furthermore, some Italian regions (Lombardy, Emilia Romagna, Tuscany, Marche, Veneto) are rich in local systems having the characteristics of IDs.

Although the region presents partially different cognitive and institutional configurations with respect to the ID, it has also attracted the attention of scholars to understand how the exchange of know-how, the information flows and the cooperative behaviours among individuals, firms, and institutions, sustain alternative patterns of innovation in the territory (Asheim et al., 2011; Capello and Lenzi, 2013; Audretsch and Feldman, 2004). Furthermore, the region is at the crossroads of internal and external knowledge inputs. In their analysis of the regional paths of development, Trippl et al. (2015) emphasize the importance to look at the process of regional industrial change not only as an endogenous phenomenon, since the contribution of exogenous sources of knowledge transferred to the region through several channels (eg. Trippl et al. 2009) is determinant for the region's path renewal and new path creation.

The second methodological issue regards the endogeneity concerns, particularly due to reverse causality. This can be expected since the decision to undertake internationalization strategies usually refer to the most performing firms, whereby the innovative activity is one of the proxies used to explain firms' performance. For this reason, we consider a reasonable time lag between the event we are analyzing (in our case, the amount of internationalization strategies by the firms in the region) and the innovation strategies of ID firms. Furthermore, the use of lagged explanatory variables allows for the endogenous cognitive processes triggered by the same event to take place, as argued in Crescenzi et al. (2015) and Ascani and Gagliardi (2015), affecting the firms' innovation strategies in the long-term.

5.1. Data

The data used for the analysis belong to the MET survey on Italian industrial firms¹³. The survey covers multiple areas of investigation, including innovation and R&D activities, international activities, and structure of the firm's market relations. Data are collected on a considerable time span, from 2008 to 2015, giving the chance to establish the cause and effect relationships among phenomena observed at different points in time. Each wave includes a sample of roughly 25.000 firms, being representative at the regional level and distributed across 12 sectoral groupings.

In the first step of our analysis, we use data from the 2015 MET survey to select a sample of 2352 firms belonging to IDs (i.e. core and not-core ID firms). To this end, we consider the municipality where the firm declares to be located in the MET survey, and we match it with the ISTAT database of ID municipalities based on the 2011 ISTAT classification of Local Labour Market Areas (LLMAs). The sample structure shows an over-representation of larger firms (especially in the mechanic industry, the transport manufacturing industry and the plastic and chemical industry), as proved by the average firm size which is equal to almost 49 employees¹⁴ (see Table 1 for the average firm size by industry and Appendix A for further descriptive statistics).

Table 1: Mean of Size by Sector. Source: 2015 MET survey (ID firms sample).

Sector	Mean (Size)	Std. Err.	[95% Conf. Interval]	
Electrical Machines	65,43	9,35	47,10	83,76
Food	44,31	9,43	25,81	62,81
Furniture	36,08	5,08	26,11	46,04
Garment	44,44	6,09	32,51	56,38
Mechanic	74,24	9,00	56,58	91,89
Metals	69,94	7,26	55,71	84,17
Other business services	19,81	3,05	13,83	25,80
Other manufacturing industries	32,06	6,16	19,98	44,14
Paper and Press	33,54	7,60	18,63	48,45

¹³ The MET survey on Italian industrial firms is realized by the independent research center, M.E.T. – Monitoraggio Economia e Territorio S.r.l. Since 2008, the M.E.T. research center has realized 5 waves of interviews, collecting information on about 25.000 firms in each wave. The survey contains extensive information about the structural characteristics of Italian firms and their strategies of innovation, R&D, internationalization and investments. The survey includes micro-sized (1-9 employees) to large firms. Further information about the activities of the M.E.T. research center and the survey can be found on the website <https://www.met-economia.it/en/#top> (last time retrieved on August, 8th 2017) and Brancati (2015).

¹⁴ While cluster analysis is done on the unweighted sample of ID firms as a way to describe their innovation strategies in 2015, the use of weights will guarantee the representativeness of the sample when we estimate the regional-level variables for the econometric analysis.

Plastic and Chemical	72,15	14,05	44,60	99,69
Transport Manufacturing	73,00	12,94	47,63	98,37
Transports, Post and Communication	27,26	3,76	19,88	34,63

The regional distribution of ID firms in our sample is a good approximation of the same distribution using ISTAT 2011 Census data on local units, highlighting the presence of three macro-groups of regions in relation to the number of ID firms located in the region. In our sample, 83,21% of the ID firms are located in Veneto, Lombardy, Emilia-Romagna, Marche, and Tuscany (85,55% using ISTAT data), which are the regions with the highest number of ID firms in absolute values, with each region having at least 7% of the sampled ID firms; 13,31% of ID firms are located in the regions with a number of ID firms comprised between 1% and 6,9% of the total sample, namely Piedmont, Puglia, Abruzzo, Campania (11,74% using ISTAT data); a residual 3,5% of ID firms are located in those regions with a share of ID firms lower than 1% with respect to the sample, that is, Liguria, Lazio, Friuli Venezia-Giulia, Trentino Alto-Adige, Umbria, Sardinia (2,71% according to ISTAT data).

5.2. The Estimation Procedure

The procedure to test our theoretical hypotheses, consists of two stages. Considering our sample of ID firms, we first classify the innovative behaviours of the firms through a cluster analysis, obtaining four clusters with different commitments to innovation. In the second step, we apply a multinomial logit model to analyse the probability of a firm to be in one of the clusters, depending on a set of variables aggregated at the regional level, such as the share of employees in those firms undertaking knowledge seeking and knowledge exploiting strategies. Lombardi and Magliocchi (2016) use the same sequence, as they first describe the different types of Italian IDs in relation to their performance and the territorial and economic changes observed between 2001 and 2011, and then they analyse whether the probability of a firm to be in one of the clusters depends on a set of firm-level characteristics (e.g. internationalization activities, innovation activities).

Prior empirical studies use cluster analysis to find out different innovation modes among firms in manufacturing and service sectors (Hollenstein, 2003; Arvanitis and Hollenstein, 2001; Peneder, 2010). Through cluster analysis, the authors describe the different patterns of innovation observed within the groups of firms with similar innovative behaviours. The result of this exercise is an unordered classification of innovation modes, highlighting the heterogeneity of innovation strategies pursued by firms. This is in contrast with the use of

measures of innovation intensity to rank firms by their level of innovativeness. In this regard, Arvanitis and Hollenstein (2001: 49) affirm that relaxing the homogenization assumption implied with rankings and recognizing heterogeneous patterns of innovation among firms, “is in concordance with the evolutionary view of technological change” as “it allows for the co-existence of different innovation types which, at least during a certain time period, may be viable in economic terms. This feature may reflect specific economic environments and/or a certain freedom for strategic choices by firms.” Based on these considerations, we use cluster analysis to sort firms into a number of groups, being as homogeneous as possible within the group (small within-cluster variance) and as different as possible between different groups (large between-cluster variance).

After identifying the groups of firms by their innovation mode, we perform a multinomial logit model where the categorical dependent variable is the group to which the firm belongs according to cluster analysis (Greene, 2003; Long and Freese, 2006). The purpose of this estimate is to measure the probability of a firm to be identified with one of the innovation modes, given a set of variables related to territorial and firm-level characteristics.

6. Discussion of Results: Predicting tomorrow’s innovation by looking at today’s internationalization

6.1. Estimation of Cluster Analysis

At this stage, we apply cluster analysis to describe the patterns of innovation among the ID firms being interviewed in the 2015 MET survey. To define the innovation types, we consider a set of qualitative and categorical variables regarding:

- the innovation strategy, captured by the firm’s dynamism in the introduction of product, process, and organizational innovations between 2014 and 2015;
- the commitment to innovation-oriented activities, related to those functions that are propaedeutic to the introduction of innovations, such as R&D or participation in activities of design of new products.

Table 2 presents the list of variables used for cluster analysis.

Table 2: List of variables used for cluster analysis.

Variable	Description	Type of Variable	Value Range	
<i>Input-oriented measures</i>			Min	Max
Experience in R&D activities	Number of years in which the firm has	Polytomous	0	4

	performed R&D between 2011 and 2015			
Involvement in activities of design of new products	Level of involvement defined from “never involved” (0 value) to “always involved” (3 value)	Polytomous	0	3
<i>Output-oriented measures</i>				
Product innovation between 2014 and 2015	Introduction of at least one product innovation (either primary or secondary) between 2014 and 2015	Dichotomous	0	1
Process innovation between 2014 and 2015	Introduction of at least one process innovation (either primary or secondary) between 2014 and 2015	Dichotomous	0	1
Organizational innovation between 2014 and 2015	Introduction of at least one organizational innovation between 2014 and 2015	Dichotomous	0	1

The descriptive statistics on the variables used for cluster analysis, reveal that the majority (54,68%) of the ID firms selected from the 2015 MET survey declare that they have not introduced any innovation between 2014 and 2015. Product innovation is the most diffused among the ID firms (31,12%), while process innovations and organizational innovations are introduced respectively by 23,77% and 22,32% of the ID firms (Table 3).

Table 3: Distribution of ID firms by type of innovation introduced between 2014 and 2015. Source: 2015 MET survey (ID firms sample).

	Yes	No	Total
Product Innovation 14-15	732	1620	2352
	31,12%	68,88%	100%
Process Innovation 14-15	559	1793	2352
	23,77%	76,23%	100%
Organizational Innovation 14-15	525	1827	2352
	22,32%	77,68%	100%

The involvement in activities focused on the creation, design and research of new products is diffusely absent (33,38%) or low (23,09%), just as the years of experience in R&D activities between 2011 and 2015 (67,98% of the ID firms declare that they have never performed R&D activities since 2011). However, we observe from Table 4 that the

distribution of the ID firms seems to concentrate on the tails for both variables, considering that 24,02% of the ID firms are involved in the design activities for all of their new products, and that 19,94% of them have regularly performed R&D activities between 2011 and 2015.

Table 4: Distribution of the ID firms by degree of involvement in design activities and by years of experience in R&S between 2011 and 2015. Source: 2015 MET survey (ID firms sample).

	0	1	2	3	4	Total
Involvement in activities of design of new products	785	543	459	565		2352
	33,38%	23,09%	19,52%	24,02%		100%
Experience in R&S 11-15	1599	146	92	46	469	2352
	67,98%	6,21%	3,91%	1,96%	19,94%	100%

6.2. Findings from Cluster Analysis

Given the above set of variables expressing the innovative behavior of ID firms, we proceed by computing the dissimilarity matrix using the Gower metric, which is suitable for both qualitative and quantitative data (Gower and Legendre, 1986). To cluster firms into groups, we then apply the average linkage method consisting in the hierarchical clustering of units by computing the average of dissimilarities at each step. After comparing the pseudo-F index of Calinski-Harabasz and the Duda-Hart index, we decide to create a grouping variable of four clusters, representing a good balance in terms of number of firms in each cluster and descriptive power of the groups with regard to the innovation patterns in the sub-sample. The four clusters differ in terms of:

- strategies of innovation (i.e. introduction of product, process, organizational innovations),
- involvement in activities related to the introduction of innovations.

Cluster 1 is the cluster of *Not-Innovators* and comprises the largest number of ID firms (over 60% of the sample). The cluster is characterized by a high share of firms that have not introduced any of the innovation types proposed in the survey (product, process, and organizational), they have very limited R&D experience (86,51% of the *Not-Innovators* has no experience in R&S) and very low involvement in design activities (around 67% of the ID firms in this cluster has no or very little involvement in design activities). The high concentration of firms in this cluster resembles the tendencies about the propensity to

innovation detected on the full sample of Italian industrial firms surveyed in MET 2015, where the use of simple descriptive statistics reveals that a high percentage of firms does not introduce product (71,51%), process (78,53%), and organizational (77%) innovations between 2014 and 2015. As reported in Table 14 presented in Appendix A, the average size of *Not-Innovators* (around 34 employees) is the lowest among the four clusters. Table 16 shows that ID firms belonging to other business services (16,91%) and to transport, post and communication services (10,06%) are largely represented in the cluster of *Not-Innovators*. Regarding the manufacturing industries, the highest shares of ID firms included in this cluster come from the garment (13,42%) and the metal (10,83%) industry.

Cluster 2 is the cluster of *Process Innovators* and includes around 8% of ID firms, which are all involved in process innovations. The ID firms comprised in this cluster, have not introduced any product innovation and only a small share of them (30,16%) has introduced organizational innovations. They have on average very low experience in R&D (63,49% of the ID firms in this cluster declare that they have never performed R&D between 2011 and 2015) and the majority of them (56,61%) says that their involvement in design activities is absent or very low. The cluster of *Process Innovators* includes medium-sized firms, having on average around 59 employees (Table 14). In the cluster of *Process Innovators*, two industries in particular are highly represented (Table 16): the metal (20,63%) and the garment industry (11,11%).

Cluster 3 is the cluster of *Product Innovators* and gathers about 17% of ID firms, which have all introduced at least one product innovation between 2014 and 2015, and they show a commitment to innovation-related activities being very high in terms of participation in design activities (60,39% is highly or always involved in design activities). The frequencies of the firms with regard to their experience in R&D give mixed evidence, as firms are distributed between having no experience (43,03%) and having the largest experience in R&D (39,12%). The first case would reflect traditional ID innovation based on the joint participation of specialized producers to the creation of new knowledge inputs through DIC-based processes, rather being generated from R&D efforts. The second case may be more suitable to describe innovations in R&D-based industries. The largest shares of the ID firms in this cluster are in fact distributed across industries of the first type (e.g. the garment industry, representing 11,49% of the *Product Innovators*) and of the second type (e.g. the plastic and the mechanic industry, representing respectively 11,98% and 15,89% of the firms in this cluster), which are to the extremes in terms of knowledge base (Table

16). In this case, we observe an average size of *Product Innovators* of around 60 employees (Table 14).

Cluster 4 is the cluster of *Complete Innovators* and contains around 14% of ID firms. This cluster presents opposite characteristics with respect to cluster 1, as firms are for the most part involved in all types of innovation (all of them have introduced product and organizational innovations, and 67,49% has introduced process innovations), they have extensive experience in R&D (more than 50% of the *Complete Innovators* has regularly performed R&D activities between 2011 and 2015), and they are highly involved in design activities (around 70% of the firms in this cluster is highly or always involved in the design of new products). The average size of *Complete Innovators* (around 94 employees) is the highest among the four clusters, suggesting that they may refer to large and vertically integrated firms. The cluster of *Complete Innovators* is particularly represented by the following industries (Table 16): the mechanic (15,17%), the plastic (13%) and the fabrication of electrical machines (13,62%) industry.

6.3. Estimation of the Econometric Model

Consistently with our theoretical background, we expect that not only do the innovation modes pursued by the ID firms in 2015 depend on the strategic orientation of the management and on the characteristics of the single firm, but also that they can be the expression of a set of environmental conditions affecting the performance of the firms within the system. In this Section, we want to test whether the overall amount of internationalization strategies undertaken by the firms in the region affects the innovative capacity of the ID firms located in the same territory. Based on our conceptual framework, we would argue this is because the type of internationalization may determine either incremental or decremental variations of the regional endowment of specialized, technological knowledge, affecting the emergence of knowledge external economies within the IDs located in the same region. More specifically, we would expect that the international openness of the region's business networks positively affects the average innovative capacity of ID firms, whenever it contributes to increase the stock of knowledge through the absorption and diffusion of external knowledge inputs. Conversely, if the overall amount of internationalization strategies in the region impoverishes the industrial composition determining the loss of specialized, technological knowledge through forgetting processes, DIC-based knowledge external economies will be weakened,

negatively affecting the average innovative performance of ID firms.

The next exercise of this research is to analyze the probability of the ID firms to be in one of the clusters identified through cluster analysis, given a set of variables representing the systemic conditions that we want to observe, and other control variables related to the system's and the firm's characteristics. Assuming unordered categories from cluster analysis, we estimate a multinomial logit model which compares the probability of membership in other categories to the probability of membership in the category picked as the base outcome. The full list of variables used in the model and the sources to collect data are presented in Table 5.

The categorical dependent variable is the grouping variable obtained from cluster analysis, that associates one of the four clusters to each 2015 ID firm. The main variables that we want to test, are related to some environmental characteristics of the region where the firm is located, particularly with regard to the amount of internationalization strategies pursued by the firms in the same area. The other regional-level indicators describe the absorptive capacity of the region. In this regard, we apply as proxies for the regional absorptive capacity: the industrial composition and the density of business networks in the region. Consistently with our previous discussion about the endogeneity concerns, we need to consider a reasonable time lag between the event we are analyzing (in our case, the amount of internationalization strategies by the firms in the region) and the innovation strategy of the ID firms, which also allows for the endogenous cognitive processes triggered by the same event to take place. For this reason, we calculate regional-level variables related to internationalization and density of local business networks, using the data contained in 2008 MET survey, while the region's industrial composition as a proxy for regional absorptive capacity has been calculated with ISTAT 2011 Census data on employment.

To gauge the extension of internationalization strategies in the region, we build up one variable for knowledge seeking internationalization strategies and one for knowledge exploiting internationalization strategies. Recalling the above definitions, knowledge seeking strategies refer to the capacity of the firm to access external knowledge inputs either by penetrating foreign markets or by establishing relationships with foreign partners. Knowledge exploiting strategies are meant to offer the firm the chance to exploit its technological knowledge in foreign markets, contributing either to the absorption of new knowledge inputs, for instance when the internationalization strategy represents the extension and not the substitution of local activities, or to the impoverishment of the local industrial composition and the loss of the related specialized know-how. In this regard, the

coefficient of the variable referred to knowledge exploiting strategies is expected to inform us about which one of the two effects is dominant. Both variables related to knowledge seeking and knowledge exploiting strategies are measured by considering the share of employees in those firms declaring to undertake at least one of the internationalization strategies described in Section 4.1 with regard to the two categories. Specifically, knowledge seeking strategies are related to direct exports, other commercial activities abroad (e.g. international fairs), commercial agreements with foreign partners, research programs and technology exchanges with foreign partners. Conversely, knowledge exploiting strategies refer to partial or total delocalization of production, production joint ventures abroad, and realization of foreign direct investments (FDIs).

The other regional-level variables control for the region's absorptive capacity. We measure absorptive capacity by considering the density of business networks and the sectoral composition of the region. The density of business networks is captured by the share of employees in those firms that declare in 2008 MET survey to have strong and stable relations with other firms and institutions in the same area. With regard to the sectoral composition of the region, we use the Herfindahl Index as an indicator of industrial diversity/specialization, where higher values of the index stand for higher levels of specialization in the territory (Mack et al., 2007; Izraeli and Murphy, 2003). We apply the Herfindahl Index to ISTAT 2011 data on employment by sector and region, where the sectors have been identified at the 2-digit ATECO 2007 and, based on the classifications introduced by the MET survey and Bellandi (1999), further grouped into:

- Mineral industries
- Food and Beverage industries
- Traditional industries (e.g. leather, textile, furniture)
- Light Mechanic industries (e.g. fabrication of metal products, computers, electrical devices)
- Heavy Mechanic industries (e.g. chemical, pharmaceutical, rubber and plastic)
- Multiutilities (e.g. energy supply, water supply)
- Other service industries

Although it simplifies the sectoral composition of the region, the classification observes the characteristics of the Italian economic system with regard to the country's industrial composition, and thus it is still informative about the structure of the regional economy. The Herfindahl Index has been measured according to the formula:

$$H_r = \sum_{s=1}^{S_r} \left(\frac{e_{sr}}{e_r} \right)^2$$

where r stands for the region, s for the industry, S_r for all the industries in region r , e_{sr} for the level of employment in s industry and r region, e_r for the level of employment in r region.

In addition, we consider some firm-level variables to control for the effect of firm's characteristics on their innovative performance (size of the firm, material and immaterial investments, industry).

Table 5: List of variables for the econometric analysis.

Variable	Description	Source
<i>Dependent Variable</i>		
Grouping Variable (g4)	Classification of firms into 4 groups through cluster analysis, where each group describes a certain innovation mode	2015 MET survey
<i>Independent Variables</i>		
<u>Regional level</u>		
Knowledge Seeking Internationalization	Share of employees in firms undertaking knowledge seeking strategies of internationalization (direct exports, international fairs, commercial agreements with foreign partners, R&D programs with foreign partners)	2008 MET survey
Knowledge Exploiting Internationalization	Share of employees in firms undertaking knowledge exploiting strategies of internationalization (productive JVs, delocalization, FDIs)	2008 MET survey
Density of Local Relations	Share of employees in firms declaring to have strong and stable relationships with firms and institutions in the same area	2008 MET survey
Herfindahl Index	See formula in the text	ISTAT 2011 Census data
<u>Firm level</u>		
Size	Dummy variable, equal to 1 if the firm has more than 250 employees ¹⁵	2015 MET survey
Tangible Investments	Dummy variable, equal to 1 if the firm has realized investments in digital marketing (e.g. software, Internet), patents, staff training, and other immaterial investments	2015 MET survey
Intangible Investments	Dummy variable, equal to 1 if the firms has realized investments in physical properties (lands and buildings), and machineries	2015 MET survey
Sector	Dummy variable, stating if the firm belongs to one of the 12 industries identified by MET survey (see Appendix A)	2015 MET survey

6.4. Findings from the Multinomial Logit Model

Table 6 presents the results of the multinomial logit model, comparing three models that have been estimated: the first one considering only firm-level attributes, the second one

¹⁵ The same construction of the size variable has been used in Crescenzi et al. (2015).

adding the variables related to internationalization, the third one comprising all regional-level and firm-level variables in our dataset. As confirmed by the chi2 statistics for each of the three cases, we consider the estimates of the third model as the better suited to explain the results of our analysis. The model compares the probability of a firm to be in one of the other groups with respect to the probability to be in the first group (the largest cluster) corresponding to the cluster of *Not-Innovators*, which is selected as the base outcome¹⁶.

Observing the coefficients, we can say that the probability of an ID firm to be in the cluster of *Process Innovators* compared to the reference category increases with higher amounts of knowledge exploiting internationalization strategies in the region where the firm is located. This may be due to the fact that prior investments abroad regarding production activities (e.g. delocalization, FDIs, productive JVs) increase the probability to observe firms in the region that further invest in the organization of the production process, as expressed by a lagged positive effect on the likelihood to be in the group of *Process Innovators* with respect to *Not-Innovators* (base outcome).

A different scenario can be observed for the group of *Product Innovators*. In this case, the higher the extension of knowledge exploiting strategies in the region, the lower the probability that an ID firm in that region belongs to the group of *Product Innovators* compared to the reference category. Furthermore, the probability of a firm to be a *Product Innovator* rather than a *Not-Innovator* increases with a higher density of local relationships and with lower values of the Herfindahl Index. These results suggest that the proximity to the production activities held in the region, a lively local network with firms interacting between each other and with institutions, and a certain level of diversity within the regional industrial structure enabling knowledge sharing across industries, increase the likelihood that an ID firm located in a region with these characteristics is included in the group of *Product Innovators* with respect to *Not-Innovators*.

Cluster 4 refers to *Complete Innovators*, as in this group we observe a high frequency of firms doing the three types of innovation (product, process, and organizational), having long experience in R&D and direct involvement in design activities. The estimates reveal that the probability of an ID firm to be in this group compared to the base outcome is higher, the higher the amount of knowledge seeking strategies (i.e. direct exports, international fairs, commercial agreements with foreign partners, R&D programs with foreign partners),

¹⁶ The coefficients related to the sector of the firm should be interpreted with caution as the sample of ID firms is not representative by industry.

and the lower the amount of knowledge exploiting strategies in the region (though the second coefficient is only weakly significant). This outcome seems to prove the assumptions emerging from our theoretical framework. Indeed, higher amounts of knowledge seeking strategies trigger DIC-based learning effects in the IDs of the region, expanding the stock of systemic knowledge where knowledge external economies emerge from, and thus favoring, in the long run, the innovative performance of local firms. Conversely, knowledge exploiting strategies reduce the probability of an ID firm to be in the cluster of *Complete Innovators* rather than the cluster of *Not-Innovators*. This would suggest that the loss of economic activities through knowledge exploiting strategies may have negative implications for the average level of innovative performance among local firms, and that this could be determined by the impoverishment of systemic knowledge due to forgetting effects. Further results concerning the last category in our model suggest that lower values of the Herfindahl Index (higher diversity) increase the likelihood of a firm to be a *Complete Innovator* compared to a *Not-Innovator*, reaffirming the importance of cross-fertilization across industries for innovation. Less straightforward is the coefficient related to the density of regional business networks, indicating that the probability of an ID firm to be in the cluster of *Complete Innovators* compared to the cluster of *Not-Innovators* decreases with a higher network density. This may be due to the fact that the cluster of *Complete Innovators* is characterized by a higher presence of vertically integrated firms, whose manufacturing process needs to rely less on local suppliers (for this reason, we may suppose that *Complete Innovators* belong to the ID, but they are not part of the main core of specialization). Indeed, those industries with the highest concentrations of *Complete Innovators* are the plastic, the fabrication of electronic machines, and the mechanic industry.

Table 6: Results of the multinomial logit model.

Innovation Strategies	model1		model2		model3	
Not-Innovators	(base outcome)					
Process Innovators						
Size	-0,0460		-0,0739		-0,0614	
Tangible Investments	1,7443	***	1,7367	***	1,7373	***
Intangible Investments	0,7685	***	0,7573	***	0,7663	***
Sector						
Electrical Machines	1,2753	**	1,2904	**	1,3229	**
Garment	1,0246	**	1,0582	**	1,0134	*
Food	0,6664		0,6924		0,7339	

Plastic and Chemical	1,4511	***	1,4607	***	1,4546	***
Other Manuf. Industries	1,3073	**	1,2995	**	1,3176	**
Furniture	0,9187		0,9069		0,9254	
Mechanics	1,0742	**	1,0719	**	1,0796	**
Transport Manufacturing	1,8504	***	1,8310	***	1,8722	***
Paper and Press	1,4770	***	1,5029	***	1,5345	***
Metals	1,6625	***	1,6764	***	1,7235	***
Other Business Services	0,7776		0,8026		0,8142	
Knowledge Seeking			-0,8033		-0,1644	
Knowledge Exploiting			10,2255	*	12,0306	**
Local Business Networks					-3,7311	*
Herfindahl Index					0,2522	
_cons	-4,4258	***	-4,3821	***	-3,0382	**
Product Innovators						
Size	0,4270		0,4269		0,3942	
Tangible Investments	0,9894	***	0,9953	***	1,0106	***
Intangible Investments	0,5043	***	0,5022	***	0,4950	***
Sector						
Electrical Machines	2,0597	***	2,0632	***	2,0367	***
Garment	1,4002	***	1,3911	***	1,4233	***
Food	1,8164	***	1,8061	***	1,7867	***
Plastic and Chemical	2,1397	***	2,1373	***	2,1524	***
Other Manuf. Industries	1,3647	***	1,3793	***	1,3690	***
Furniture	1,6338	***	1,6375	***	1,6410	***
Mechanics	2,0368	***	2,0444	***	2,0521	***
Transport Manufacturing	1,6643	***	1,6782	***	1,6316	***
Paper and Press	1,1459	**	1,1378	**	1,1193	**
Metals	1,5926	***	1,5882	***	1,5823	***
Other Business Services	0,7357	*	0,7268	*	0,7208	*
Knowledge Seeking			1,0227		0,8033	
Knowledge Exploiting			-8,0572	*	-11,9979	**
Local Business Networks					2,6149	**
Herfindahl Index					-5,4875	**
_cons	-3,3956	***	-3,5907	***	-3,3793	***
Complete Innovators						
Size	0,9925	***	0,9975	***	1,0001	***
Tangible Investments	0,9124	***	0,9189	***	0,9250	***
Intangible Investments	1,5612	***	1,5594	***	1,5606	***
Sector						
Electrical Machines	2,3858	***	2,3898	***	2,3856	***

Garment	1,2708	***	1,2615	***	1,2383	**
Food	1,9911	***	1,9747	***	2,0140	***
Plastic and Chemical	2,1622	***	2,1592	***	2,1560	***
Other Manuf. Industries	0,6786		0,6980		0,7107	
Furniture	1,4405	***	1,4419	***	1,4598	***
Mechanics	1,8782	***	1,8822	***	1,8845	***
Transport Manufacturing	2,0812	***	2,1000	***	2,1018	***
Paper and Press	1,2924	**	1,2860	**	1,3101	**
Metals	1,1442	**	1,1430	**	1,1849	**
Other Business Services	0,8418	*	0,8324	*	0,8292	*
Knowledge Seeking			1,1942		2,5668	**
Knowledge Exploiting			-9,9324		-10,9160	*
Local Business Networks					-3,4391	**
Herfindahl Index					-7,8634	**
_cons	-4,1152	***	-4,3318	***	-1,4736	
Statistics						
chi2	500,0296		526,0420		548,3854	

Note: *, **, *** indicates significant effects at the 10%, 5%, and 1% level, respectively

We now consider the average marginal effects generated by a change of each independent variable on the probability to be in one of the clusters (i.e. our dependent variable). The estimates of the marginal effects overall confirm the results of the multinomial logit model. Table 7 shows that regional knowledge exploiting strategies have a positive and statistically significant effect on the probability for a firm located in that region to become a *Process Innovator*. Conversely, the density of local business networks in the region are related to a lower probability to become a *Process Innovator*. This would suggest that firms located in a region with high concentration of knowledge exploiting strategies and loose business networks, fuel a process of knowledge accumulation based on the improvement of organizational processes, such as those related to the coordination of a global network. The necessity to improve the organizational structures is confirmed by positive and statistically significant coefficients referred to tangible and intangible investments.

Table 7: Margins for Process Innovators.

	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]	
Knowledge Seeking	-0,0610	0,0941	-0,65	0,517	-0,2455	0,1234
Knowledge Exploiting	1,1823	0,4005	2,95	0,003	0,3973	1,9672
Local Business Networks	-0,2513	0,1398	-1,80	0,072	-0,5253	0,0227
Herfindahl Index	0,2186	0,2937	0,74	0,457	-0,3571	0,7943
Size	-0,0249	0,0255	-0,98	0,329	-0,0750	0,0251

Tangible Investments	0,0906	0,0145	6,24	0,000	0,0621	0,1190
Intangible Investments	0,0227	0,0118	1,92	0,055	-0,0004	0,0458
Sector						
Electrical Machines	0,0244	0,0392	0,62	0,533	-0,0523	0,1012
Garment	0,0294	0,0364	0,81	0,420	-0,0420	0,1007
Food	-0,0069	0,0422	-0,16	0,869	-0,0896	0,0757
Plastic and Chemical	0,0349	0,0368	0,95	0,343	-0,0372	0,1071
Other Manuf. Industries	0,0588	0,0372	1,58	0,114	-0,0140	0,1316
Furniture	0,0166	0,0388	0,43	0,669	-0,0594	0,0926
Mechanics	0,0145	0,0368	0,39	0,693	-0,0576	0,0866
Transport Manufacturing	0,0730	0,0402	1,82	0,069	-0,0057	0,1518
Paper and Press	0,0693	0,0386	1,79	0,073	-0,0064	0,1450
Metals	0,0766	0,0348	2,20	0,028	0,0085	0,1448
Other Business Services	0,0328	0,0373	0,88	0,380	-0,0404	0,1060

Based on Table 8, we observe that the probability to become a *Product Innovator* is negatively related to the concentration of knowledge exploiting strategies and positively related to the density of business networks in the region, confirming the role of multiple business specializations and the connections among them to trigger DIC-based external economies in the IDs of the region.

Table 8: Margins for Product Innovators.

	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]	
Knowledge Seeking	0,0366	0,1334	0,27	0,784	-0,2248	0,2980
Knowledge Exploiting	-1,5105	0,6988	-2,16	0,031	-2,8801	-0,1409
Local Business Networks	0,5188	0,1685	3,08	0,002	0,1885	0,8490
Herfindahl Index	-0,5211	0,3559	-1,46	0,143	-1,2187	0,1765
Size	0,0253	0,0324	0,78	0,435	-0,0383	0,0889
Tangible Investments	0,0825	0,0169	4,88	0,000	0,0494	0,1156
Intangible Investments	0,0091	0,0169	0,54	0,590	-0,0240	0,0423
Sector						
Electrical Machines	0,1862	0,0567	3,29	0,001	0,0751	0,2972
Garment	0,1413	0,0554	2,55	0,011	0,0328	0,2498
Food	0,1726	0,0582	2,96	0,003	0,0585	0,2866
Plastic and Chemical	0,2066	0,0557	3,71	0,000	0,0975	0,3157
Other Manuf. Industries	0,1445	0,0587	2,46	0,014	0,0294	0,2597
Furniture	0,1659	0,0565	2,94	0,003	0,0552	0,2767
Mechanics	0,2070	0,0541	3,83	0,000	0,1011	0,3129

Transport Manufacturing	0,1304	0,0651	2,00	0,045	0,0028	0,2579
Paper and Press	0,0893	0,0646	1,38	0,167	-0,0374	0,2159
Metals	0,1531	0,0550	2,79	0,005	0,0454	0,2608
Other Business Services	0,0607	0,0580	1,05	0,295	-0,0530	0,1744

The results presented in Table 9 confirm that the probability of a firm to become a *Complete Innovator* increases with higher concentrations of knowledge seeking strategies and with higher knowledge diversity in the region (lower values of Herfindahl Index). The two variables express, in fact, the positive implications for complete strategies of innovation determined by the opportunity for local firms to learn from diverse knowledge sources, either located in the region or in foreign markets. The coefficient of regional business networks is negative and statistically significant, suggesting that *Complete Innovators* are not involved in local supply chains, however, they may participate into different localized learning mechanisms, such as imitation and labor mobility (Crespo and Fontoura, 2006). As in the multinomial logit model, knowledge exploiting strategies are negatively related to the probability to become a *Complete Innovator*, although the coefficient of the marginal effect is not significant in this case.

Table 9: Margins for Complete Innovators.

	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]	
Knowledge Seeking	0,2449	0,1229	1,99	0,046	0,0040	0,4859
Knowledge Exploiting	-0,9503	0,6114	-1,55	0,120	-2,1487	0,2480
Local Business Networks	-0,3806	0,1694	-2,25	0,025	-0,7126	-0,0487
Herfindahl Index	-0,6575	0,3672	-1,79	0,073	-1,3772	0,0622
Size	0,0930	0,0260	3,58	0,000	0,0420	0,1440
Tangible Investments	0,0413	0,0147	2,81	0,005	0,0125	0,0702
Intangible Investments	0,1364	0,0142	9,58	0,000	0,1085	0,1643
Sector						
Electrical Machines	0,1685	0,0501	3,36	0,001	0,0703	0,2667
Garment	0,0720	0,0503	1,43	0,152	-0,0265	0,1706
Food	0,1458	0,0514	2,84	0,005	0,0450	0,2465
Plastic and Chemical	0,1394	0,0491	2,84	0,005	0,0432	0,2357
Other Manuf. Industries	0,0145	0,0571	0,25	0,799	-0,0973	0,1264
Furniture	0,0898	0,0524	1,72	0,086	-0,0128	0,1925
Mechanics	0,1196	0,0488	2,45	0,014	0,0238	0,2153
Transport Manufacturing	0,1432	0,0541	2,65	0,008	0,0372	0,2492

Paper and Press	0,0810	0,0556	1,46	0,145	-0,0280	0,1900
Metals	0,0516	0,0496	1,04	0,297	-0,0455	0,1488
Other Business Services	0,0531	0,0509	1,04	0,296	-0,0466	0,1529

6.5. Robustness Checks

To verify the robustness of our results, we first use some combinations of the Wald test on the coefficients of our regressions, and then we do a second estimation based on the entire sample of firms in 2015 MET dataset. Through the Wald test, we observe that the hypothesis that the coefficients are equal across all the equations is rejected. Concerning the coefficients for the cluster of *Complete Innovators* related to the two types of internationalization strategies which were of primary interest for our analysis, we can reject the hypothesis that both coefficients are simultaneously equal to 0 at the 5% level of significance. If taken separately though, the coefficient of knowledge exploiting strategies related to the cluster of *Complete Innovators* is only weakly significant at the 10 % level, calling for further investigation to prove our theoretical assumptions.

The second type of robustness check repeats the sequence of analysis on the entire 2015 MET survey. Thus, we cluster all the (ID and not-ID) firms in the original survey by their innovation mode using the same variables as in the primary analysis (see Table 2), and then we estimate a multinomial logit model to assess how the set of regional-level and firm-level variables affects the probability of a firm to be in one cluster compared to the base outcome. In this case, we also introduce a dummy variable for being an ID firm. Due to the size limits of the statistical software, we consider only the firms located in those regions with the highest concentration of IDs, namely Veneto, Lombardy, Emilia-Romagna, Tuscany, and Marche.

The output from cluster analysis confirms the results of the primary analysis, identifying four clusters by firms' innovation strategy: cluster 1 is the cluster of *Not-Innovators*, cluster 2 is the cluster of *Process Innovators*, cluster 3 is the cluster of *Complete Innovators* and cluster 4 is the cluster of *Product Innovators*. As we can see from Table 10, the most interesting result in this second analysis, is that the probability of a firm to be a *Complete Innovator* (i.e. involved in product, process, and organizational innovations, R&D and design activities) increases with higher values of knowledge seeking strategies and with lower values of knowledge exploiting strategies, confirming the estimates obtained in our primary model.

Table 10: Marginal effects for *Complete Innovators* referred to the set of ID and not-ID firms. Source: 2015 MET survey.

	Delta-method					
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]	
Knowledge Seeking	0,4370	0,1703	2,57	0,01	0,10	0,77
Knowledge Exploiting	-1,8840	0,5044	-3,74	0,00	-2,87	-0,90
Local Business Networks	-0,2427	0,2148	-1,13	0,26	-0,66	0,18
Herfindahl Index	-1,0826	0,6049	-1,79	0,07	-2,27	0,10
Tangible Investments	0,0802	0,0394	2,04	0,04	0,00	0,16
Intangible Investments	0,0516	0,0396	1,30	0,19	-0,03	0,13
Size	0,1136	0,0136	8,33	0,00	0,09	0,14
District	-0,0287	0,0093	-3,08	0,00	-0,05	-0,01
Sector						
Other Manuf. Industries	0,0464	0,0203	2,28	0,02	0,01	0,09
Food	0,1143	0,0183	6,24	0,00	0,08	0,15
Mechanics	0,1537	0,0149	10,34	0,00	0,12	0,18
Paper and Press	0,0000	(omitted)				
Metals	0,0709	0,0164	4,33	0,00	0,04	0,10
Furniture	0,0900	0,0187	4,81	0,00	0,05	0,13
Other Business Services	0,0863	0,0159	5,44	0,00	0,06	0,12
Garment	0,0755	0,0174	4,34	0,00	0,04	0,11
Electrical Machines	0,1870	0,0159	11,78	0,00	0,16	0,22
Plastic and Chemical	0,1522	0,0159	9,58	0,00	0,12	0,18
Transport Manufacturing	0,1072	0,0211	5,07	0,00	0,07	0,15

7. Conclusions

The research explores the impact of regional international openness on the innovative patterns undertaken by the ID firms located in the same region. Based on the conceptual frame described in this Chapter, localised industries, such as IDs, benefit from the exchange of specialised know-how through dense network relationships, contributing to the emergence of knowledge external economies that support the innovative performance of local firms. Internationalization has reshaped the industrial and cognitive configuration of the IDs, questioning the opportunity for local firms to benefit from localized learning processes.

The main hypothesis of this research is that the two types of internationalization strategies, i.e. knowledge seeking and knowledge exploiting, measured at the regional level, may either support or constrain the emergence of knowledge external economies in the IDs of the same region, affecting the innovative capacity of the ID firms. To test our hypothesis,

we have applied an econometric analysis based on a multinomial logit model, where the categorical dependent variable consists of the clusters identified by their innovation strategy through cluster analysis. The results of our investigation highlight heterogeneous effects of internationalization on the innovation patterns pursued by the ID firms, depending on the type and amount of internationalization strategies in the region.

Knowledge seeking internationalization, supposed to bring external knowledge inputs inside the region, increases the probability of the ID firms to become *Complete Innovators* over time. Based on our theoretical framework, we would argue this is because external knowledge inputs generated on foreign markets and captured by the ID firms in the region, expand systemic knowledge and trigger new opportunities of DIC-based knowledge external economies. However, this does not necessarily mean that it is only the ID firms within the core of specialization that fuel these knowledge external economies from the inputs accessed through knowledge seeking internationalization. This is proved by the fact that the probability to become a *Complete Innovator* is negatively related to the participation into local business networks, and thus we may suppose that they refer to those ID firms not belonging to the main core of specialization. Therefore, knowledge inputs from foreign markets may be grasped by those ID firms that are not in the core, but nevertheless they may contribute to trigger knowledge external economies through other localised learning processes, such as imitation, labour mobility, and information diffused in the territory through third parties, primarily institutional actors (e.g. business associations) and service firms (e.g. consultancy). In the long run, these learning processes may transform the endowment of specialised, technological knowledge within the system, either contributing to reshape the core of specialization with new business fields coming out, or starting new paths of development (i.e. new cores).

Conversely, knowledge exploiting internationalization, whereby the firms exploit their technological knowledge on foreign markets, is related with two different patterns of innovation. In the first case, we observe that the amount of knowledge exploiting strategies in the region increases the probability of an ID firm to become a *Process Innovator* rather than a *Not-Innovator*, suggesting that the involvement into international networks of production encourages the accumulation of competencies related to process management and organization (i.e. horizontal internationalization). On the other side, the amount of knowledge exploiting strategies decreases the probability of an ID firm to become a *Product* or a *Complete Innovator* rather than a *Not-Innovator*, highlighting potentially weakened DIC-based learning processes due to a substitution effect with local business

networks (i.e. vertical internationalization). In the latter case, the process of forgetting culminating in the loss of fragments of knowledge and related specialised competencies, drives the firm towards alternative (and less challenging) patterns of innovation with respect to the *Product* or *Complete Innovators*, as it reduces the opportunities for knowledge external economies based on DIC.

The conceptual frame described in this Chapter has proved to be key to interpret the results of this research. On this basis, we could first underline that internationalization may not have the same impact on IDs, and then justify the heterogeneous effects of the two internationalization types on the innovation strategies of ID firms in terms of the learning or forgetting opportunities they may generate.

The original approach of the empirical analysis based on a comprehensive view of different internationalization strategies and their effects on the economic systems, faces us with ample margins of further improvement of our conceptual and econometric scheme. For instance, the analysis of the cognitive processes (i.e. learning and forgetting) would benefit from a longitudinal analysis which would help us suppose the dynamics of knowledge external economies over time. Furthermore, the availability of data about the different strategies of internationalization on a more detailed geographical scale would give us more precise information on the implications of internationalization for the innovative performance of the firms located in the same territory. Nevertheless, the importance of the emerging intuitions for other scholars in the field and for policy-makers, calls us to drive much efforts on the exploration of the relation between internationalization and structural transformations in local economic systems, such as IDs.

Acknowledgments

It would not have been possible to realize this research without the support received from the research center MET – Monitoraggio Economia e Territorio in Rome. In particular, I wish to thank Raffaele Brancati, Emanuele Brancati, Andrea Maresca and Manuel Romagnoli, for letting me access the MET database and for their precious comments.

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Learning, Unlearning and Forgetting from Internationalization. The case of the Macerata-Fermo footwear Industrial Districts

Abstract

The increasing internationalization of Industrial Districts (IDs) is affecting the system's production organization and the institutional context surrounding it, raising concerns about the role of localized industries for the development of local societies. The purpose of this paper is to analyze the endogenous cognitive processes triggered by the international openness of the local supply chain, and to disentangle the potential development paths that the system can undertake from the variations observed in the endowment of specialized knowledge due to learning, forgetting and unlearning effects. Based on a qualitative research design, we focus on the Macerata-Fermo footwear IDs in the Marche region (Italy), and analyze whether international openness is triggering learning, forgetting or unlearning processes, increasing the heterogeneity of know-how nuclei. The analysis reveals that while the Fermo IDs seem to be undertaking unlearning processes concentrated within the cognitive core, the Macerata footwear IDs may be more prone to adjust the local production organization through diagonal synergies across different sectors, for instance between the production of rubber soles and heels and other local industries specialized in plastic molding. The degree of industrial diversification within the two local societies is key to define their paths of development, favoring unlearning processes towards other industries in response to structural shocks.

Keywords: Learning, Unlearning and Forgetting; District internationalization

1. Introduction

A few events characterizing the recent decades have questioned the significance of the industrial district (ID) model in the contemporary economic landscape. Primarily, the integration of these systems into global value chains (GVCs) and the introduction of advanced technologies in the manufacturing process, raise concerns about the “disembeddedness” of relationships from their geographical and cultural context, and the decreasing importance of human labor for manufacturing industries. As such, this process of change is addressing the heart of the ID model, by affecting the production structure, and its capacity to trigger embedded relationships and to represent the basis for the development of local societies.

By referring to the production structure of IDs as to the system's cognitive frame, insofar as it includes the endowment of specialized competencies related to local industries, we argue that the variations observed in the cognitive frame are the effects of endogenous cognitive processes, leading to the expansion or contraction of competences related to certain business fields. In other terms, through the analysis of the endogenous cognitive processes we can detect the trajectories of development that the system is undertaking and that may result in the growth or decline of local industries.

Keeping in mind this approach, the purpose of this Chapter is to analyze the endogenous cognitive processes triggered by the international openness of the ID supply chain, and to disentangle the potential development paths that the system can undertake from the variations observed in the cognitive frame. To explore these processes, we realize a case-study research focusing on the footwear IDs located in the provinces of Macerata and Fermo in the Marche region (Italy). Through a qualitative research design based on the collection of information from interviews and desk research analysis, we first investigate on the systems' participation into GVCs, highlighting the main internationalization strategies that local firms are pursuing. In this regard, we analyze the implications of the diverse opportunities of internationalization for the endogenous cognitive processes, and distinguish between those channels that fuel learning processes and thus the expansion of the system's competence set, and the others that undermine the endowment of specialized competencies as a consequence of a forgetting process. After discussing about the main endogenous cognitive processes triggered by international openness, we propose some considerations regarding the potential trajectories of development that the IDs in the two provinces are undertaking.

In order to analyze how international openness is contributing to define the development path in the Macerata-Fermo IDs, we briefly recall our conceptual framework in Sections 2 and 3, by describing the structures that contribute to the reproduction of IDs, namely the endowment of specialized know-how (i.e. the cognitive frame) and the network relationships enabling the emergence of external economies (i.e. the institutional frame). Section 4 is dedicated to discuss about our case study, and concludes by describing two potential trajectories of development that the IDs are undertaking. In Section 5 we conclude with some final remarks about the analysis presented in the Chapter.

2. Production structure and specialized know-hows in IDs

Recalling the traditional description of the ID model, the ID production structure comprises a multitude of micro to medium-sized firms specialized in the production of products and services within the same supply-chain. The bundle of phase and final firms involved in the main industry of specialization represents the ID production core, which is also the largest depository of the specialized know-how, skills and competencies accumulated in the system. Conceiving firms as centers of specialized knowledge, we can relate the ID production structure to the cognitive configuration of the system, which is one of the key elements we need to consider in order to discuss about the development paths that the ID can undertake.

In a recent paper, Bellandi and Santini (2017) compare different trajectories of development undertaken by IDs as a result of a two-layered analysis of the cognitive and the institutional configuration of the system. They describe the cognitive frame of the ID as a multiplicity of know-how nuclei distributed within the cognitive core and in the rest of the local society. The nuclei collect firms that are homogeneous in terms of field of activity, specialized know-how, and characteristics of the actors. In our discussion, the know-how nuclei reflect the endowment of specialized competences within the system (e.g. competencies related to a certain manufacturing phase, to marketing activities, to strategic planning, and so on), requiring a more fine-grained analysis than the firm-level specialization to map the set of specialized competences.

A network of strong and weak ties connects the nuclei, revealing the interdependencies among competencies that are strong when they refer to the same supply-chain (i.e. cognitive core), but they can also be established between more distant fields of activity (e.g. between one nucleus of the core and one in the rest of the local society). In both cases, cultural and geographical proximity supports the establishment of trust-based relationships, which facilitate not only the economic exchange in business transactions, but also the sharing of ideas, and of bits of specialized know-how throughout the system.

The concentration of specialized know-hows in the ID cognitive core and the ease of knowledge diffusion is at the basis of the process of knowledge accumulation based on decentralized industrial creativity (DIC), where every field of specialization contributes to spread ideas and to create new combinations from them, incrementing the stock of systemic knowledge (Belliandi, 1992). The cognitive core's nuclei enable this collective process of learning by contributing to knowledge sharing and recombination within the network they

establish in the ID, sustaining innovation and diversification within the same core and in the rest of the multiplicity of know-how nuclei¹⁷.

However, the interference of numerous factors – for instance, the introduction of a new technology that radically changes the organization of the supply-chain, the change of customers' tastes on the demand side, or the increasing competitive pressure from emerging economies, just to mention a few – may affect the structure of know-how nuclei and thus the cognitive configuration of IDs, as well as the network of relations connecting the nuclei within the system. To understand the implications of exogenous factors for the structural transformations observed in IDs, we focus on the internationalization of the local supply-chain and see how the cross-border exchange of knowledge inputs embodied in business relations affects the endogenous cognitive processes.

The hypothesis that we want to test in this Chapter is that the international openness of IDs triggers processes of learning, forgetting and unlearning that change the structure of know-how nuclei, defining the system's trajectory of development. Whenever the international linkages established between the system and the foreign markets through business relations, expand the set of competencies within the ID multiplicity, new learning opportunities are encouraged contributing to the accumulation of knowledge in the existing or in new know-how nuclei (Bathelt and Cohendet, 2014; Becattini and Rullani, 1996). This is the case of the new competencies gained, for instance, from the local firms' participation into international networks of sale and distribution through the exporting activity (Chiarvesio et al., 2010), and from the collaboration with external multinational enterprises (MNEs), as observed in the ID of Montebelluna specialized in sport equipment (Belussi and Asheim, 2003).

Nevertheless, international openness can lead to the depletion of specialized competencies, for instance as a consequence of massive delocalization practices undertaken by ID firms. This is verified by Amighini and Rabellotti (2006) with regard to the Barletta footwear ID. The contraction of the ID multiplicity within the core and in the rest of the local society triggers a process of forgetting of systemic knowledge that impoverishes learning opportunities based on DIC, hampering the system's development path.

¹⁷ The statement refers to the endogenous process of learning, based on the sharing of specialized know-hows through the local network. However, it does not intend to minimize the role of exogenous factors in affecting knowledge accumulation in IDs. We will consider this point when discussing about the effects of internationalization on the ID cognitive processes.

In addition to knowledge accumulation through processes of learning and knowledge depletion through processes of forgetting, we can observe a third type of reconfiguration of the system's cognitive structure, corresponding to the process of unlearning. In this case, the set of know-how nuclei within the ID multiplicity is subjected to the expansion of some nuclei and to the contraction of other nuclei, leading to both incremental and decremental variations of systemic knowledge. This would describe the system's development path, that may be either based on the existing ID cognitive core or contribute to start a new path of development with the spawning of new cores (Ingstrup and Christensen, 2017). Empirical evidence on Italian IDs shows diverse examples of local systems which experienced a change of specialization towards related fields during their history, as it happened in Mirandola (Emilia Romagna) which was previously specialized in the textile industry and then shifted to the mechanical and biomedical industries (Giuliani and Rabellotti, forthcoming).

Based on the findings from our case study, we analyze how the participation of IDs into international networks has affected the reconfiguration of their cognitive structure as a combination of processes of knowledge accumulation and knowledge decay, giving us indications about the possible development paths that the system may undertake.

3. Socio-institutional structures supporting the renewal of IDs

In our discussion about the structural transformations of IDs and the development paths that may potentially unravel from them, we cannot leave the set of institutional factors impinging on the economic system out from our analysis. The nexus between society and economy has been recently reaffirmed by Granovetter (2017), who argues that “social, political, intellectual, legal, and family influences, among others, play key roles in shaping how the economy runs” (p. 135). Granovetter calls these spheres as institutional sectors defining the superordinate social context that orients and influences the behaviors of individuals, the acceptance of norms and the affirmation of cultural elements inside that specific context¹⁸. He says, in fact, “neither individuals nor norms can exist or be

¹⁸ Social institutions consist of “sets of persistent patterns defining how some specified collection of social actions are and should be carried out” (p. 136). Although there is still debate on the boundary of a single institution and on the set of institutions supporting the entire society, what we emphasize in this research is that the institutional architecture defining a certain social context affects behavior and changes slowly over the time.

understood without discussion of their larger social context and the structures that emerge from the interaction and aggregation of these elements” (p. 136).

Due to its distinctive properties of geographical and cultural proximity, the ID represents a privileged environment to observe the interplay between institutional and economic structures characterizing the system. Dei Ottati (2002), for example, firmly believes that not only do economic factors stemming from local external economies boost extra productivity and thus competitive advantage for local firms, but also social and institutional factors (i.e. social cohesion, shared objectives among the main local interest groups, sense of belonging to the local community and production system) lie at the heart of the enduring economic success of IDs. Bearing in mind the interaction between society and economy, we move on to the definition of the institutional frame affecting the system’s economic behaviors. This is key to have a comprehensive view of the system’s evolutionary path and to make assumptions over its future development trajectories.

3.1. The institutional frame of IDs

Firms gain some sorts of productivity advantages (in terms of quality, quantity, and even innovation) by being localized in a territory endowed with a specific configuration of economic, political and socio-cultural factors. This point has been at the core of regional studies, where scholars have contributed to highlight the sources of competitive advantage within groups of co-located firms by describing different types of agglomeration, such as IDs (Becattini, 1990), clusters (Porter, 1990), innovative milieux (Camagni, 1991; Maillat, 1998), and regional innovation systems – RIS (Cooke, 1992). Though the concepts are based on partially different conceptual pillars, they all emphasize the importance of the systemic network developed around the system’s focal points (involving firms, public and private institutions, such as government agencies, education and research centers, business associations), to create network synergies and sustain the emergence of productivity advantages for the co-localized firms, as mentioned above.

The establishment and expansion of a network inside the economic system is not an event that we can entirely plan, nor we can linearly predict the outcome of a deliberate intervention aimed at triggering interaction and exchange.

The work by Dei Ottati on IDs (e.g. 1991, 2009) acknowledges the importance of the institutional frame to foster relations based on mutual cooperation in the ID, which trigger positive synergies in combination with the internal competitive pressures deriving from the co-location of firms specialized in similar activities within the same local market. With

regard to the ID institutional frame, Dei Ottati (2009) makes a distinction between semi-automatic cooperation and deliberate actions. Semi-automatic cooperation corresponds to local business interactions supported by a set of implicit norms and shared customs that everybody in the ID observes because of replication of others' behavior, or because they know they would incur social sanctions if they overlooked them. Semi-automatic cooperation may evolve in more deliberate and formal types of coordination, corresponding to explicit rules and policies introduced when informal institutions are too weak to coordinate the local division of labor.

Therefore, we can mention two fundamental systemic conditions determining changes in the network structure, either encouraging or discouraging the establishment of interactions: one is related to the informal institutions, which correspond to shared customs and implicit norms emerging in a community of people with similar cultural background; the other one regards formal institutions, being the outcome of deliberate interventions realized by the stakeholders from the private and public sector in response to specific needs of the society. The cultural background where the network is embedded predicts the value of the relationships in terms of their stability and quality (e.g. how many resources the actor is willing to exchange through a certain tie). As widely agreed in the literatures focused on the sources of local development, actors belonging to the same cultural background share a relatively higher cultural and cognitive proximity compared to actors not belonging to the same environment. The fact that within a certain social context the same cultural base underpins every behavior and interaction, facilitates the emergence of a set of informal institutions (tacit norms, customs), regulating the socio-economic life of the organization. Becattini (1990) and Dei Ottati (2002) portray the social environment of IDs, characterized by the presence of a local society living and working in the same territory and bonded over common cultural traits regarding the system of values (e.g. ethic of work, family), meanings, language, and so forth. On this basis, the local society equips itself with social rules (Mistri and Solari, 2003), establishing a sort of social order where rule violators are ostracized and a cooperative ideology can emerge (Breschi and Malerba, 2005: 179). The presence of social rules regulating the organization, represents a guarantee for network ties and triggers stable relations based on trust, loyalty, and cooperation. Acting as a glue on network interactions, the set of informal institutions highly influences economic relations, as they curb the cases of opportunistic behavior and allows for efficient contracting across firms to take place.

The spontaneous emergence of informal institutions influenced by shared socio-cultural factors, does not entirely explain the foundations of networks in economic systems. The second condition corresponds to the deliberate interventions undertaken by stakeholders (firms and public agencies) to improve coordination in the economic system through the introduction of various types of collective goods, through public policies and political actions, such as the provision of services of regulated local monopolies and the development of infrastructures (Bellandi, 2009; Trigilia, 2001). If seen as the outcome of conscious acts aimed at regulating and coordinating complex societies, we can find some degree of comparability between this type of collective goods and the formal institutions in the Northian sense. Keeping in mind that the institutional frame co-evolves with the society, as it represents its fundamental architecture and at the same time receives feedbacks from it, formal institutions are introduced when the complexity of the society reaches a point in which informal institutions on their own are not sufficient to coordinate individuals' behavior and interaction. The establishment of formal institutions integrates informal institutions to rule complex societies, and contributes to increase efficiency in transactions, facilitating exchange of every sort (North, 1990)¹⁹.

From an evolutionary perspective, changing market environments impact on the ID economic structure increasing uncertainty and thus questioning the effectiveness of the ID institutional frame. The adjustment of the ID and thus the capacity of the organization to find a new equilibrium for sustainable local development, occur when both the cognitive frame deriving from the ID economic structure, and the institutional frame are involved in this process of change. Dei Ottati (2009: 209) argues, in fact, that "if the institutional balance is shattered, so is also the positive interaction between competition and cooperation that lies at the heart of the competitive advantage in the district model. When such a breaking point is reached, the synergy between the social and economic factors that constitutes the pillar in the district's vitality gives way." However, while the adjustment of the ID cognitive frame and the reconfiguration over a new multiplicity of know-how nuclei occurs through a natural selection of the most competitive firms, the renewal of the institutional frame is much less automatic than that. The fact that formal and informal institutions are inherited from the history of the ID as the outcome of an evolutionary process (Pike et al. 2010), increases institutional homogenization which might constrain

¹⁹ A more detailed discussion about the transaction costs implied in network relations is out of the scope of this paper, as the issue will not be specifically addressed in the empirical research.

the search for diverse and more effective institutions, and thus the capacity of the system to unfold a different trajectory of development in front of unexpected changes (Grabher and Stark, 2007). When the system is locked-in by a high degree of institutional homogeneity, the adjustment of the institutional frame requires systemic leadership in deliberate collective actions able to drive structural changes and thus to stop or avoid the system's deterioration, as argued in Bailey et al. (2010). The authors emphasize the role of local leadership "to facilitate the systemic functioning of socio-economic-institutional relations" through the introduction of "new or renewed specific public goods" (p. 460).

The bottom line of this discussion can be summarized in few key points:

- 1) The ID network is supported by a set of informal and formal institutions, which allow for the establishment of stable relationships based on mutual cooperation, trust and loyalty and thus trigger positive synergies within the system, such as the emergence of local external economies;
- 2) The socio-cultural context impinges on the informal institutions that the ID adopts, which then pave the way for the introduction of formal constraints when there is a need to coordinate more complex issues in the local society;
- 3) The institutional frame tends to evolve gradually, and in a way that is strictly dependent on the history of the organization, raising doubts on the long-term adaptability of the system to changing market environments;
- 4) Collective actions undertaken by the main stakeholders of the local governance (firms and public agencies) and consisting on the introduction of specific public goods, may help the system to increase heterogeneity in the set of available development trajectories by revitalizing local interactions and boosting new connections in the system.

The next point to be discussed is related to the definition of the cultural background affecting the ID institutional frame. To do this, we draw upon recent contributions based on extensive field research in traditional Italian IDs undertaken by sociologists and anthropologists. In this way, we highlight those cultural aspects that most affect the adjustment of the institutional frame and that will be further detected in the case study presented in this research.

3.2. A focus on the cultural background supporting the ID institutional frame

The idea of “productive chorality” proposed by Giacomo Becattini (2015) describes the collective involvement of the ID inhabitants into the activities of production realized in the territory. This sort of internal coherence derives from the strong interplay between the production structure and the social context of the ID, where both economic and personal relationships are embedded into the place having a strong heritage of naturalistic, historical and cultural traits. He argues, in fact, that the productive chorality of the place is “based not only on the technical, spatial and cultural proximity of the firms, but also, and more so, on the strength of the uniformity and congruity of the culture of the people and families who live there” (p. 36). This sense of chorality emerges from the presence of diverse local actors (families, firms, local government) and from their involvement into the institutional frame by forming groups of interest or “cultural entities” embedded into the place. The conditions for the realization of the productive chorality rest on (and at the same time, contribute to the evolution of) the ID “cultural background (in the anthropological sense), [...] on which are also projected, people’s individual decisions, including economic ones” (idem).

In Bellandi and Santini (2017), we find a comment on the previous quotation, in particular on “the anthropological sense” related to the ID cultural background and on the elements representing the cultural heritage of the place.

“The “anthropological sense” of the cultural background points specifically to the accumulation of a peculiar intangible cultural heritage, giving an identity to the place, in terms of traditions of productive know-how, trade of commercial goods, and care of common goods within the place, together with related jargons, symbols, rituals, norms, values, and inherited institutional frames” (Belliandi and Santini, 2017: 89).

The ID traditions of specialized know-how are an integral part of the cultural background of the place. The embeddedness of ID firms into a specific cultural background brings a bundle of opportunities for them, as it facilitates the exchange of goods, ideas and specialized competencies within the population of local firms. At the same time, changes observed in the production structure of the ID, such as those related to the entry or exit of firms, impact on the role that the main local industry has for the other sectors within the local society, and sometimes it questions its meaning at the center of the cultural background of the place.

Staber and Sautter (2011) consider collective identity as an intangible asset and a source of competitiveness for clusters. Referring to their definition of collective identity, we can argue that for this intangible asset to be achieved and constantly renewed in IDs, it is key

that a large part of the members of the local society maintain a “shared understanding of the basic industrial, technological, social, and institutional features” supporting the organization (Staber and Sautter, 2011: 1350). Dei Ottati (2009) describes the consequences of increasing competitive pressures affecting the supply-chain relationships within the ID. From her analysis, we can see that in response to external challenges, firms may adopt self-centered strategies that are not coherent with the conditions supporting the existence of local networks, often resulting in the shutdown of many firms and in the impoverishment of local relationships. The overall contraction of the ID production core due to a diffused misalignment among firms’ mindsets, makes it difficult for the local community to identify with the ID main industry of specialization.

Based on an inter-disciplinary approach to the social impact of industrial change, Strangleman et al. (2013) emphasize the importance of estimating the effects of economic transitions, not just in terms of unemployment rates or plant closures, but also with regard to the social and cultural legacies that industrial change leaves to present and future generations²⁰. This reveals once again the tight bond between the production structure of a certain community and its cultural background, and implies that industrial change may radically question the cultural values people have about “work, class, identity and place” (idem, p. 9). Drawing on the case of deindustrialization in Youngstown, known in the Fifties as “Steeltown USA”, Rhodes (2013) conceives the industry as “the crux of construction of place and identity”, and describes how the loss of manufacturing activities previously embedded into the cultural background of the place, has threatened the meaning people attach to their day-to-day life in Youngstown and thus the collective identity of the place. The physical transformations of the landscape, (e.g. due to industrial demolitions and firms’ closure) brought about by deindustrialization, represent materially and symbolically the reorientation of the place, calling upon the need to reshape collective identity by reconstructing the past in accordance with the new economic, social and cultural context.

Recent studies on some Italian IDs conducted by anthropologists, reveal how the industrial restructuring of these territories in the years of economic crisis has profoundly affected the meaning of work for local communities, undermining their collective identity and thus their capacity to reposition on more competitive paths of development. Analyzing the jewelry

²⁰ The authors focus on the social implications of deindustrialization, defined as the process leading a certain society to stop making things or to produce less with fewer workers.

ID of Valenza, Fontefrancesco (2016) describes how the work in the main industry of specialization has represented a source of wealth for two generations, ensuring high earnings and opportunities to undertake an entrepreneurial career even for people with low levels of education. After the crisis, the trust on the possibility of social emancipation offered by the jewelry industry, has gradually diminished and has paved the way to a more pessimistic view about the future, leading workers to lose identification with their jobs and communities, convincing many families to dissuade their children to undertake a professional career in an industry characterized by high levels of uncertainty and instability, and instilling in the public debate the idea of developing a local economic system that is more plural and less based on the jewelry sector. This, however, would determine a detachment from the past of the ID, eroding that part of the cultural background (i.e. specialized know-hows, skills, ideas) which the main industry was grounded in and once identifying the local community. Ghezzi (2016) focuses on the Brianza furniture ID and explores, through his ethnographic research, the causes that have led to the disappearance of a specific professional figure, the carver (*"intagliatore"*). In addition to cyclical factors regarding the demand and supply side (e.g. increasing automatization of the carving process, emergence of new styles and fashions in the furniture industry), he argues that the absence of young apprentices willing to acquire specialized competencies and to identify with the artisanal vocation of the place, has significantly contributed to the impoverishment of specialized know-hows. This is partly due to the fact that the job was previously inherited from the family according to a patriarchal constraint, until the last generation of carvers, aging today around fifty years old, recognized greater autonomy for young people to explore other careers, believing that they would not be able to bear the fatigue of the carver work. Additionally, the author recognizes a diffused resistance by experienced carvers to hire young apprentices and to spend part of their time in transferring specialized know-how to them. The progressive disembeddedness of the ID production dimension due to the decreasing number of carvers and their specialized skills and competencies, has not received adequate support from the institutions, accentuating the effects of unfavorable market conditions and resulting in the decline of the ID.

This point will be further addressed in the discussion of the case study. The key question is: do changes of the cultural background contribute to explain a certain development path undertaken by IDs? The issue will be discussed in the context of IDs, taking into account the aggregate effects of the internationalization strategies undertaken by ID firms. International openness has certainly impacted on the cultural elements of collective

identity, changing the way people in the ID “perceive” the main industry of specialization. Whenever the internationalization strategies have detrimental effects on the ID production structure with plant closures and loss of jobs, the hollowing-out of many firms wipes out part of the cultural background of the place built on the main industry of specialization, resulting into the overall impoverishment of collective identity. The fragmentation of the cultural background and the weaker sense of collective identity reduce the benefits from local external economies for the surviving firms, undermining the future development of the ID.

4. The case of the footwear IDs in the Marche region

The empirical research presented in this Chapter concerns the endogenous cognitive processes in IDs triggered by the internationalization of the local supply chain, which has an impact on the configuration of the ID production structure (for instance, due to plant closures, expansion of local leader firms, or establishment of foreign-owned branches of multinational enterprises in the ID). By impinging on the system’s production structure and thus on the endowment of specialized know-how and on the interdependencies among them, the involvement of the ID into an international network of production affects the type of cognitive process that the system can perform. Whether it gives rise to processes of knowledge accumulation through DIC-based learning, or to processes of knowledge decay through forgetting, the internationalization of the local supply chain contributes to explain the development path that we may expect from the ID, corresponding to the expansion and diversification of the multiplicity in case of knowledge accumulation and to the contraction and loss of know-how nuclei in case of knowledge decay.

To investigate the issue, we adopt a threefold approach that considers the main pillars of the ID cognitive processes: the cognitive configuration, the institutional frame, and the cultural background where the first two are embedded in. The research is based upon the information collected in the footwear IDs of the Marche region through a qualitative research design. After investigating the innovation trends and the extended network structure of the ID firms, we describe the main transformations within the system’s multiplicity of know-how nuclei and thus identify the development paths that the system is undertaking.

4.1. Methodology

The case study focuses on the footwear IDs in the Marche region, regarding the territory between the provinces of Macerata and Fermo. According to the classification of Local Labor Market Areas (LLMAs) based on 2011 ISTAT Census data, we can identify 7 IDs specialized in the leather and footwear industry in the two provinces (Table 1). Although they are distributed between the two provinces (3 IDs in the province of Macerata, 4 IDs in the province of Fermo), the IDs are highly interdependent with regard to the organization of the local supply chain and show largely similar institutional frames (Cutrini, 2011).

Table 1: Leather and Footwear IDs in the Marche region. Source: ISTAT.

LLMA 2011	Province	Specialization	N° of Municipalities	Population	Local Units	Employees in LUs	Manufacturing Local Units	Employees in Manufacturing LUs
CIVITANOVA MARCHE	Macerata	Leather and Footwear	4	73.265	7.547	29.294	1.202	8.534
MACERATA	Macerata	Leather and Footwear	12	111.305	10.787	42.645	1.392	10.553
TOLENTINO	Macerata	Leather and Footwear	11	36.400	3.425	12.466	501	4.254
FERMO	Fermo	Leather and Footwear	12	77.358	7.861	27.536	1.213	7.458
MONTEGIORGIO	Fermo	Leather and Footwear	20	35.888	3.483	12.918	896	6.512
MONTEGRANARO	Fermo	Leather and Footwear	2	21.224	2.077	8.915	731	5.514
PORTO SANT'ELPIDIO	Fermo	Leather and Footwear	2	42.292	4.323	16.563	1.151	8.217

The case study approach allows to capture the complexity of the phenomenon under investigation, and to derive interpretative clues based on the data collected from the field research (Yin, 2009; Birkinshaw et al., 2011).

The overall approach of the field research is inspired by the criteria of ethnographic research, having the purpose to go deeper into the organizational culture and to achieve an insight into how the organization deals with certain events at the heart of the analysis (Watson, 2012). According to this view, the collection of information through different methods of investigation, including interviews, desk research and use of data analysis, should be enriched with the researcher's observation of the events in their original setting. The observation of real time behaviors has the purpose to enable a better understanding of the organizational context, and also to reduce as much as possible the loss of spontaneity in interviewed stakeholders who may be biased by several factors, such as the structure of questions or the awareness of being "under observation". Some authors argue that during interviews, respondents manifest only that information located at the conscious level, while

they may overlook other information that is more subconscious, or that they do not intend to disclose. For this reason, the observation of the agent in his/her natural context, where he/she can explain directly the normal proceeding of the events inside the organization, may be a successful strategy for this research, aiming at analyzing the cognitive processes, which are mostly latent and not manifest at the conscious level.

To understand how internationalization has affected the cognitive processes in the Macerata-Fermo IDs, we organized a set of interviews with local agents between April and June 2017, starting from the consultation of the most relevant institutions (business associations, chambers of commerce, schools) and then proceeding with interviews at a sample of representative firms. The involvement of different types of actors generates a rich set of information about the system's socio-economic dynamics using multiple perspectives, from the business and the institutional setting, to analyze the issue. The focus of the interviews was first on the main industry of specialization, although we have subsequently decided to include firms from business sectors that are more marginal with respect to the production core, in order to explore any possibility to start a new process of cognitive differentiation and expansion also from these weak connections. Consistently with the cognitive and institutional frames of the Macerata-Fermo IDs, we selected a group of respondents which could better represent the heterogeneity of the systems with regard to the issues under investigation. We conducted 23 interviews involving 15 firms, 4 public institutions, 2 business associations, and 2 private enterprises specialized in knowledge intensive business services (KIBS). The selection of firms enabled to have a comprehensive view of the entire footwear supply-chain, as it included firms producing components and accessories, firms working as subcontractors, and final firms responsible for the upstream and downstream activities of the *filière* (Table 2).

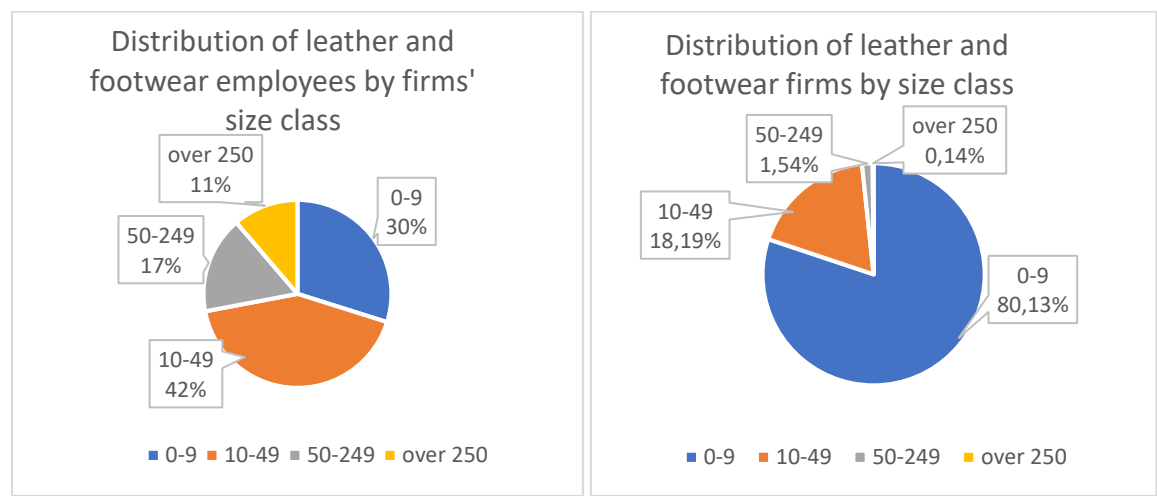
Table 2: List of Interviews. Source: Author's elaboration.

Interview	Industry	Specialisation	Province	Size Class	Type of Respondent
<i>Firms</i>					
Firm 1	Footwear	Final Firm	Macerata	10 – 49	Chief Operating Officer
Firm 2	Footwear	Final Firm	Macerata	10 – 49	Stylist (Company owner)
Firm 3	Footwear	Final Firm	Macerata	50 – 249	Strategy Manager
Firm 4	Footwear	Final Firm	Macerata	10 – 49	Administrative Director (Company owner)
Firm 5	Footwear	Final Firm	Macerata	Over 250	Administrative Director

Firm 6	Footwear	Final Firm	Macerata	10 – 49	Head of Production
Firm 7	Footwear	Final Firm	Macerata	1 – 9	R&D Manager (Company co-owner)
Firm 8	Footwear	Component Producer	Macerata	50 – 249	Administrative Director
Firm 9	Footwear	Subcontracting Firm	Macerata	10 – 49	Administrative Director (Company owner)
Firm 10	Footwear/Plastic	Component Producer	Macerata	50 – 249	Sales Manager
Firm 11	Footwear	Final firm	Fermo	10 – 49	Administrative Director
Firm 12	Footwear	Final firm	Fermo	10 – 49	Administrative Director (Company Owner)
Firm 13	Footwear	Component Producer	Fermo	1 – 9	Stylist (Company Owner)
Firm 14	Footwear	Component Producer	Fermo	1 – 9	Administrative Director (Company Owner)
Firm 15	Plastic	Component Producer	Fermo	10 – 49	Administrative Director
<i>Other local actors</i>					
Public Institution 1	Governmental Institution		Regional		Supervisor of funding projects for SMEs innovation and internationalization
Public Institution 2	Trade Association		Macerata		Supervisors of the Centre for Statistics
Public Institution 3	Trade Association		Fermo		Supervisors of the Centre for Internationalization
Public Institution 4	Education		Fermo		Supervisor of the course dedicated to the footwear industry
Private Institution 1	Business Association		Macerata		Area Manager (Footwear Industry)
Private Institution 2	Business Association		Fermo		Director
KIBS Firm 1	Consultancy		Macerata		Leading consultant in marketing strategy
KIBS Firm 2	Consultancy		Fermo		Leading consultant in organizational and process strategy

The sample of interviewed firms presents an over-representation of firms sized between 10 and 49 employees (53%). However, although the provinces of Macerata and Fermo are largely composed of micro-sized firms (1 – 9 employees), the category of firms between 10 and 49 employees attracts the largest share of employees in the leather and footwear industry according to ISTAT 2015 data (Figure 1.a. and 1.b).

Figure 1: Distribution of leather and footwear employees (1.a) and firms (1.b) by firms' size class in the Macerata-Fermo provinces. Source: Author's elaboration based on ISTAT data 2015.



The interview questions were strongly related to the conceptual framework considered before to understand the cognitive processes in IDs. However, some minor changes have been applied during the course of the field research to refine questions and to have a more punctual insight on the topics under investigation. The interview was based on unstructured questions, having the purpose to stimulate the respondent's memory on past events and to start a narration about the topics in relation to the respondent's experience. The questionnaire addressed to institutions had the purpose to collect sound information on the general trends observed in the main industry of specialization and in the other industries of the Macerata-Fermo territory. The points explored with the institutions were related to their view about:

- The sectoral composition of the territory, with an insight to emerging and disappearing specializations;
- The institutional support to the formation and diffusion of knowledge;
- The degree of inward and outward internationalization and the support provided by the institution;
- The innovative capacity of local firms and the support provided by the institution.

The second wave of interviews regarded the firms of the Macerata-Fermo IDs. Table 3 presents a list of the topics covered during the interviews with firms. The purpose of each section is to gather information about the relevant dynamics inside the organization,

focusing on the evolution of the business structure, product and process innovation, and participation into local and extra-local networks of production.

Table 3: Topics of the interviews with firms

Topic	Purpose
History of the firm	Understanding how the overall structure of the firm has changed since its foundation
Evolution of the production process	Understanding how the technology applied to the production process has evolved in the past 10 years
Evolution of the intermediate/final product	Understanding how the (intermediate or final) product has evolved in the past 10 years
Change of participation into local networks	Understanding how the local network of relations has changed over the past 10 years
Process of internationalization	Understanding to what extent local firms are involved into the internationalization process

The interview's questions invited the respondent to think over current and past activities, in order to detect the recent dynamics concerning the main topics of analysis. To adopt a longitudinal perspective, we considered a timeframe of around 10 years, compatibly with the memory of the respondent and with the history of the firm. During some of the interviews with firms, we had the chance to visit the organization, especially the production laboratories, which has been fundamental to observe first-hand how firms' operations are structured and to develop a better insight of the organizational context.

We supported the information collected through interviews with a thorough desk research, involving the analysis of company websites, institutional reports, articles from newspapers, and data on the provinces of Macerata and Fermo released by the Chamber of Commerce. In addition to having an insight on the IDs from the interviews, we collected information on the trends of innovation and internationalization in the footwear industry at the national level, in order to have a benchmark to interpret the findings from the case study. To build up our benchmark, we referred to the data released by public agencies (e.g. Chambers of Commerce) and other institutional reports, such as the one realized by the national business association of the firms specialized in the footwear industry, *Assocalzaturifici*.

All the material collected through desk research and interviews was analyzed with the support of the NVivo software for qualitative research (Richards, 1999). This enabled a systematic organization of the coding process regarding the entire set of data sources.

Through coding, we organized the bulk of information collected from the field research by identifying coding categories which facilitate further retrieval and interpretation of the emerging themes (Corbin and Strauss, 2008). We started from first-level coding categories based on prior analysis of the literature and aimed at identifying the main trends in the production structure and institutional frames. After careful consideration of interview transcripts, notes and other materials, we decided to reach a more fine-grained analysis of the text including second-level categories on the cultural background of the place, which is key to understand the development paths of the IDs located in the provinces of Macerata and Fermo (Bazeley and Jackson, 2012).

4.2. Origins of the footwear IDs in the provinces of Fermo and Macerata

The history of the footwear industry in the southern territory of the Marche region dates back to the first half of the nineteenth century when small artisans from the Fermo province started to produce the “*chiochierie*”, i.e. slippers with leather outsole and fabric upper, and then to sell them in the Papal States and in the rest of the peninsula, reaching also some foreign countries facing the Mediterranean, such as the Greek islands and other territories of the Turkish empire (Sabbatucci Severini, 2012)²¹.

The end of the nineteenth century was characterized by the establishment of small workshops specialized in the production of components and accessories in the areas surrounding the original production nucleus, corresponding to the cities of Montegranaro, Monte Urano, Monte San Giusto and Sant’Elpidio a Mare. After the crisis of the industry in the first decade of the twentieth century due to competitive pressures from foreign markets and incapacity to adapt the local organization of production largely based on handmade manufacturing, the ID showed signs of recovery between the two World Wars, when the first shoe factories were established and the local infrastructures were significantly improved. At this time, the historians of the ID describe a primordial local division of labor, with the emergence of workshops for the production of heels, leather cutting, uppers sewing, and other laboratories specialized in intermediary stages of the value chain.

The end of the Second World War marked the beginning of the process of light industrialization driven by the footwear industry and the shift of employment from

²¹ Anselmi (1989) argues that the manufacturing of shoes in the area started much earlier, in the Middle Age, when the shoemakers produced almost exclusively for their town market.

agriculture to manufacturing (Cutrini et al., 2013). In this regard, the collective actions undertaken by many local municipalities were decisive for the introduction of new institutions in support of the industrial activity, such as the establishment of a school for model makers or the incentives to investments in buildings and machineries (Sabbatucci Severini, 2012).

Between 1950 and 1980, the system experienced a period of runaway expansion in terms of number of local units and employees, arriving at its peak during the Seventies with the increasing vertical disintegration of production and the proliferation of small phase and final firms, that altogether formed a dense production network able to guarantee product differentiation, quality, reduced time-to-market, and flexibility. The end of this period coincides with the drastic reduction of labor supply due to the higher levels of education and the wealthier living conditions of young generations, interrupting the positive trajectory of development that had characterized the industry in the previous years.

In the last two decades of the twentieth century, the footwear industry underwent radical changes, due to the increasing competition from foreign countries, such as Spain, Brazil and a range of south-Asian countries (e.g. China, Taiwan, Korea), the turning of East European countries into market economies, the improvement of information technologies, and the entry of Italy into the Euro zone (Amighini and Rabellotti, 2006). As a result of these changes in the macroeconomic scenario, the Marche footwear IDs have suffered a backlash, starting from the increase of imports and the decrease of export shares, which exacerbated in the first decade of the twenty-first century with the rise of products realized in low-income countries (e.g. China) and the demand decline from European countries (Cutrini, 2011). Unfavorable market conditions led many ID firms to increase delocalization practices especially towards Central and East European countries (Bulgaria, Romania, Albania) with the purpose to cut production costs (Tattara, 2009), determining the reduction of the set of firms specialized in those phases of the production process, hit by delocalization especially in the upstream phases of production.

Despite the quality upgrading of products, the competitiveness of the IDs has been severely undermined by the incapacity of many small local producers to cope with market challenges, as revealed by the drop in local units and employees regarding both the final firms and, as a domino effect, the rest of the local production network. This has led in recent years to the emergence of two types of development paths within the Macerata-Fermo IDs: one related to the multitude of micro and small firms working as subcontractors with low profit margins, and the other one represented by the leader firms with more structured and

complex organizations and being responsible for the control of upstream and downstream activities of the value chain (Cutrini, 2011; Cirese et al., 2007).

Today, the IDs of Fermo and Macerata still present a network structure characterized by a multitude of firms specialized in the final and intermediary stages of the footwear supply chain. Although being endowed with a large number of producers of components and accessories (such as, soles heels, uppers, design and model making studios), some stages of the supply chain are external to the territory, such as machinery manufacturing and tanneries. Data from ISTAT 2011 Census reveal a high concentration of manufacturing employment in the Macerata-Fermo IDs, with three IDs listed among the first ten Italian IDs by manufacturing intensity (Table 4).

Table 4: Classification of the first ten Italian IDs by Manufacturing Intensity (%). Source: ISTAT.

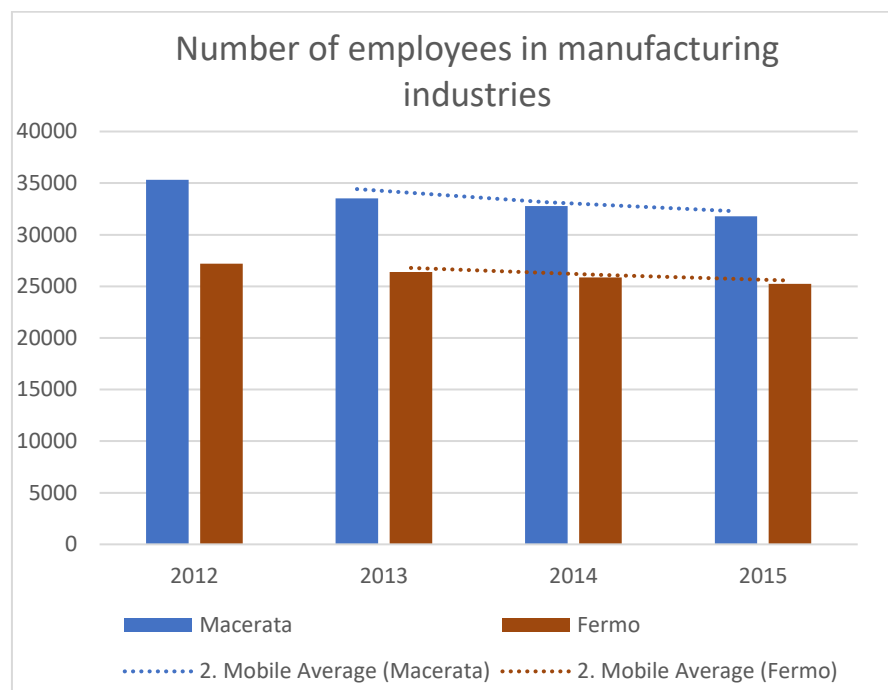
LLMA 2011	Province	Specialization	N° of Municipalities	Population	N° of Manufacturing Local Units	Employees in Manufacturing Local Units	Manufacturing Intensity (%)
ARZIGNANO	Vicenza	Leather and Footwear	15	98.670	1.827	26.967	27,33%
MONTEGRANARO	Fermo	Leather and Footwear	2	21.224	731	5.514	25,98%
VESTONE	Brescia	Metallurgy	18	25.162	525	6.094	24,22%
CASTEL GOFFREDO	Mantova	Garment	6	24.783	453	5.671	22,88%
GUASTALLA	Reggio Emilia	Mechanics	4	39.811	479	7.800	19,59%
ODERZO	Treviso	Houseware	12	77.911	1.029	15.179	19,48%
GRUMELLO DEL MONTE	Bergamo	Chemical and plastics	21	82.045	1.452	15.971	19,47%
PORTO SANT'ELPIDIO	Fermo	Leather and Footwear	2	42.292	1.151	8.217	19,43%
LUMEZZANE	Brescia	Mechanics	14	77.033	1.548	14.461	18,77%
MONTEGIORGIO	Fermo	Leather and Footwear	20	35.888	896	6.512	18,15%

Note: Manufacturing intensity is measured by the ratio between employees in manufacturing local units and total population. IDs located in the province of Fermo are highlighted in grey.

More recent data on industrial composition and employment express the difficult time for the manufacturing sectors in the Macerata-Fermo IDs. Between 2010 and 2016, the number of active firms in the two provinces of Fermo and Macerata has declined by around 7%, the highest value among the provinces of the Marche region (data from the Open Data Explorer available on the website of the Chamber of Commerce of Macerata). During the same period, the province of Macerata has shown the highest loss of firms in manufacturing

sectors (-11,55 %) compared with the other provinces of the region (-6,97% in the province of Fermo). The two provinces register a contraction of manufacturing employment between 2012 and 2015. While the province of Macerata shows an average decrease of manufacturing employment by 3,5%, the province of Fermo registers an average decrease by 2,4%. Concerning the employment in the footwear industry (two-digit ATECO 2007), the negative values increase substantially (-6% in the province of Macerata, -3% in the province of Fermo).

Figure 2: Manufacturing employment between 2012 and 2015 in the provinces of Fermo and Macerata. Absolute values in thousands and average variation. Source: Author's elaboration based on ISTAT data.



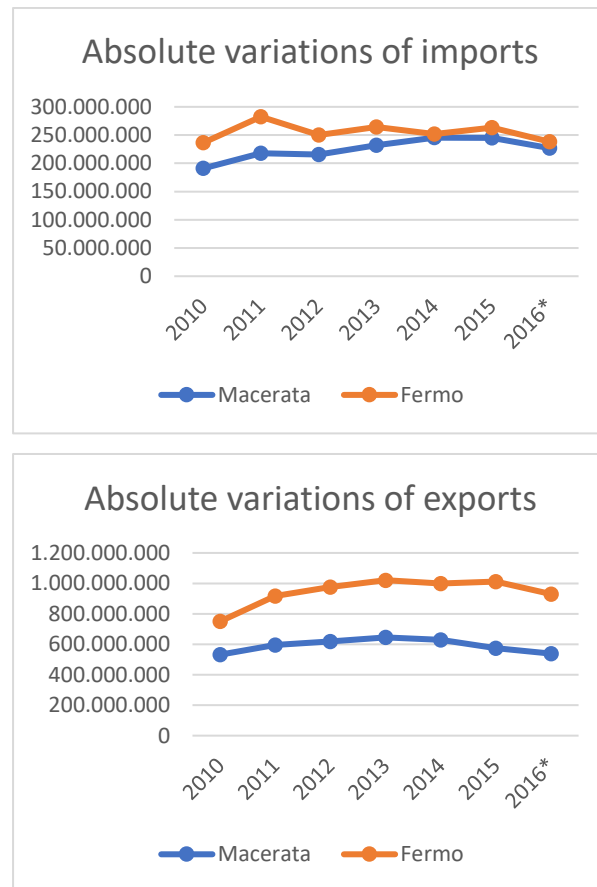
4.3. Discussion about the degree of internationalization of the Macerata-Fermo IDs

In response to the challenges imposed by global markets, ID firms have undertaken different strategies of internationalization. De Marchi et al. (2014) analyze how IDs firms participate into global value chains (GVCs), and distinguish between two types of internationalization. While upstream internationalization refers to the strategy of producing some parts and components abroad through offshore outsourcing or FDIs, downstream internationalization is related to the commercialization of final products through exports or

by improving the firm's distribution network. In addition to these strategies of outward internationalization – exports, offshore outsourcing, FDI – IDs have undergone inward internationalization as they have attracted multinational enterprises addressing their activities into the territory, either through commercial agreements with local producers (subcontracting or licensing), or through FDI (Sammorra and Belussi, 2006).

Recent trends about the internationalization of the provinces of Fermo and Macerata, confirm the view of the footwear IDs located in the area as highly integrated within GVCs. Figure 3.a and 3.b shows the values of imports and exports related to the footwear industry between 2010 and 2016. While the province of Macerata registers an average variation of +3% of import values and +0,4% of export values, the centrality of the footwear industry for the economy of the province of Fermo is confirmed by lower average variation of import values (+0,7%) and higher average variation of export values (+4%). More recent trends of import and export values reflect the current issues regarding the internationalization of the Macerata-Fermo IDs. Between 2014 and 2016, we observe that import values have decreased on average by 3,7% in the province of Macerata and by 2,6% in the province of Fermo, which would be in line with the current trend of production reshoring mentioned by the interviewed institutional experts. In the same period, export values have decreased by 7,6% in the province of Macerata and by 3,5% in the province of Fermo, revealing the impact of the commercial restrictions introduced in 2014 between the UE and Russia on the systems' export performance.

Figure 3: Variations of import (3.a.) and export (3.b) values in the leather and footwear industry. Source: Author's elaboration based on COEWEB ISTAT data.



*: Data on year 2016 are provisional.

Using the information collected through interviews and desk research, we will now focus on the degree of involvement of the Macerata-Fermo IDs into GVCs. The main channels of internationalization that will be analyzed are related to the most diffused strategies of international openness undertaken by the IDs under consideration, namely sales internationalization through exports, production internationalization (especially through subcontracting activities), and attraction of external multinational enterprises. The analysis has the purpose to explore what types of cognitive processes are triggered by the combination of internal knowledge inputs emerging from the local set of know-how and external knowledge inputs gained through international openness. By observing the changes of the ID cognitive configuration as a result of internal and external dynamics, we will then identify the different development paths characterizing the footwear IDs in the province of Macerata and those in the province of Fermo.

4.3.1. Exports

Starting from the Eighties, exports have been the main internationalization strategy undertaken by local firms. Nord European countries, including Germany, Belgium, and Scandinavia, were the most frequent destinations of final products. The interviews with local stakeholders reveal that the exporting activity has always been a priority for local firms and even the smallest and less-structured ones have shown extraordinary capacities to sell on foreign markets.

“It is typical of the footwear industry that even the smallest firm has the capacity to go abroad. Our firms have an astounding capacity to be on foreign markets. Then, in some cases, they have joint foreign institutions, like the Italian-Russian Chamber of Commerce or the Italian-Chinese Chamber of Commerce.”

(Author’s translation based on the interview with a local business association)

In the past, exporting was an effortless activity for local firms, as it did not require sound strategies supported by structured organizations behind the decision to become international. The entrepreneur used to visit foreign clients with his collection and sometimes the same foreign clients came to the firm to purchase its products.

“In the Seventies and Eighties, when firms started to export, German, Belgian and Dutch clients came to us. Sometimes, there was not even the need for local entrepreneurs to go to them. In the Nineties, local entrepreneurs organized themselves with representatives, independent agents. They started to build up an international sales network.”

(Author’s translation based on the interview with a local business association)

In the Nineties, local firms have found golden opportunities to export in Eastern European markets, and especially in Russia, characterized by a demand that was sophisticated and eager for spending on expensive and luxury products. Between the Twentieth and the Twenty-first century, the high profits from exporting to the Russian market enabled many local firms to experience an exceptional growth and to support their business with more structured organizations. Although being highly profitable for at least one decade, the high specialization of the IDs on the Russian market has exacerbated the effect of the commercial restrictions introduced from 2014 between the European Union and the

Russian government, determining two-digit losses of turnover and the closure of many firms in the footwear industry (both final firms and component producers). In the words of a local business association, “what has happened since 2014, is something that is going to be remembered in the history. It was a terrible blow that made us lose many firms and many of those which have survived have lost double-digit shares of their turnover, but it led someone to think more carefully about their business”.

The heavy economic crisis of the last years is urging firms to reconsider their approach to strategic planning of internationalization activities, which would facilitate the diversification of exporting markets (e.g. Japan, USA, Middle Est). In fact, the echo of the crisis has been amplified by “the lack of management structures capable to identify diversified internationalization strategies (*ndr*, with regard to export market diversification), which would have created alternative opportunities to overcome the difficulties with the Russian market”, says another institutional respondent.

The recovery from this downturn is marking a boundary between those firms that have recognized the necessity to change and are adapting their organizational structure accordingly, and the other firms that lag behind because of the property’s cultural resistance or because the small size represents a constraint to internationalization due to limited financial and managerial resources. In the first case, we observe that some firms are investing to improve their marketing activities and distribution channels, for instance providing the organization with skilled personnel in marketing and commercial functions, or revising the management of distribution channels with the support of external agencies or taking on the direct control of the distribution network (without independent agents or representatives). These examples usually correspond to the more structured firms of the IDs, either the leader firms with higher numbers of employees and relatively more advanced organizational structures, or the medium-sized firms belonging to business groups. The firms that struggle to organize their own distribution network, are small and medium-sized final firms and component producers, having in common flat organizational structures and internationalization strategies largely based on the intuition of the entrepreneur.

Today, exports still represent the largest source of revenues for the majority of firms in the Macerata-Fermo IDs, including final firms and component producers (especially, sole producers). Final firms with poor organizational structures but nevertheless having their own brand, usually rely on foreign buyers to sell their products abroad (“We do not sell in Italy. We sell only abroad to big department stores. We show them the product, they buy

it, and that is all. They do not give us any information about the market”, says an entrepreneur). Much more frequent though is the development of an international sales network composed of agents, representatives and distributors, collaborating with the firm to analyze the sales trends and collect information on the foreign demand.

“The main channels to sell abroad are agents, representatives, and international fairs. The main export destinations are Germany, Benelux, Scandinavia, Switzerland, France, USA and Russia. (...) In Russia we have lost a lot. (...) With agents we do periodical meetings. They visit shops, collect information and then they tell us what the shops have been selling more both of our products and those of our competitors, they analyze what the customer is asking for and then we do meetings involving stylists and agents to discuss about all this.”

(Author’s translation based on the interview with a final firm)

Exceptionally, the manager of a final firm in the province of Fermo declares to rely on specialized employees to organize the firm’s international sales network. This is because he believes that the targeted client for their luxury products cannot be approached through a distribution network based on agents, but rather it requires the direct involvement of the firm to build up a stronger relationship and to increase its ability to timely adapt the product to the client’s needs.

“We have almost no agents (...) The sales and distribution activities are managed by us (...) When selecting foreign markets for exporting, we do in-depth investigations to understand the opportunities for penetration of our product, and we do that with our staff members. Who is in the sales department regularly visits the foreign market, to see if there are good chances to sell our products in that market. (...) We also receive information from our clients, we talk with them. Thus, there is a constant activity of monitoring foreign markets.”

(Author’s translation based on the interview with a final firm)

4.3.2. Production internationalization

In the Nineties, local firms started to delocalize labor-intensive production functions, particularly leather cutting and upper production, to Central and Eastern European countries, mainly with the purpose to tackle global competition by increasing production

efficiency (Tattara, 2009). The most frequent approach to delocalization was through subcontracting relationships with foreign independent suppliers (i.e. offshore outsourcing). Whilst offshore outsourcing was a common practice in the IDs, even among small firms, examples of FDI have always been rare and usually regarding those firms that had already an adequate organizational structure to bear the costs of the investment and to control the production network (Corò and Volpe, 2006).

As affirmed by Cutrini (2011), the delocalization of labor-intensive production activities (i.e. leather cutting and upper production) is still widespread in the Macerata-Fermo IDs and increasingly addressed to Southeast Asia (China and India) especially with regard to cheaper products. According to the information collected through the interviews, firms affirm to have established stable relationships with their foreign suppliers and positively remark on the skills enhancement that there has been in foreign markets over the past decades. In this regard, firms are also motivated to produce abroad because they can more easily find the necessary specialized competencies that are lacking in the IDs due to the unsuccessful generational change in the footwear industry. The manager of a firm specialized in medium-high price shoes, argues that “the activities realized abroad (ndr, through offshore outsourcing) are leather cutting and upper production (...) There is still an advantage to produce abroad, which is not just in terms of costs (that certainly is still there), but it is related to the fact that the foreign supplier is part of the history of our firm. They know how the product has to be realized, they do it always in the same way, so they are extremely loyal. It is not just a matter of partnership. We have a true relationship of friendship with the manager of this foreign plant, who used to work inside our firm for 30 years.”

Despite many firms still producing (at least partially) abroad, local institutions have reported that the increasing labor costs and the upgrading of product quality, is leading them to reconsider their strategy of production internationalization and to bring some production activities back. Accordingly, a component producer specialized in soles production, argues that in the Nineties the company had realized a foreign direct investment (FDI) in Romania, which was managed by a person sharing a trust-based relationship with the entrepreneurs of the parent company. However, when the volumes of production have decreased, initially due to the economic crisis and then to the shift towards higher quality products, the parent company decided to close the foreign plant, showing that foreign production was used as an expansion of the production realized at home.

Instead of being a mere efficiency-seeking strategy to lower current production costs, the participation into an international network of production represents today an opportunity for firms to diversify their product lines in relation to the quality content, combining local and foreign production accordingly. High-quality products for the luxury segment, characterized by high profit margins and low volumes of production, are more frequently realized in the IDs, while low and medium-quality products for the mass market continue to be produced in low-cost countries.

“Since we produce everything in Italy with the support of workshops and component firms from this territory, it is evident that our production costs are high. Therefore, we must explore the highest segment of the market (ndr, namely the luxury segment) to be competitive, because our chances to survive would be none otherwise.”

(Author’s translation based on the interview with a final firm)

Therefore, to be competitive on global markets, local firms are working towards the optimal combination of local and global, improving the higher value-added activities in the IDs, concerning both in-house executive functions (e.g. product design, product industrialization, marketing, distribution) and the manufacturing activities related to high-quality products, and moving abroad the lower-value added activities. This can be observed at all levels of the supply chain, with regard to final and intermediary firms (Accetturro et al., 2011).

4.3.3. Attraction of External Multinational Enterprises

In the Macerata-Fermo IDs, the presence of affiliates owned by Italian and foreign multinational enterprises (MNEs, external to the IDs) is relatively limited compared with other IDs (e.g. Riviera del Brenta, see Rabellotti, 2004). However, some well-known luxury brands have established their production branches in the territory, working in synergy with the local supply chain. For instance, a foreign affiliate has recently started a collective project involving the University of Ancona, firms specialized in the footwear supply chain and in other complementary industries (KIBSs, mechanical industry), aimed at implementing automated processes in footwear manufacturing.

While they act as collectors of knowledge by absorbing the specialized know-how from hot-spot locations (such as, IDs), the affiliate of external MNEs usually bring more advanced organizational competences into the territory, triggering a two-way process of

knowledge exchange (Driffield et al., 2010). This is reported also by the interview with a local consultancy:

“The relationship between local firms and famous brands has always been two-way, because external MNEs certainly have brought more advanced organizational structures, but local producers have given them (and are still giving) specialized know-how. Maybe these famous brands have their own stylists, but very few of them possess the kind of technical knowledge required to produce them.”

(Author’s translation)

In the Macerata-Fermo IDs, we identify external affiliates that are very prone to organizational and process innovations, for instance by introducing automated warehouses to store and retrieve semi-finished products, or by reconfiguring the layout of production laboratories to increase productivity and workers’ safety. We report the example of a foreign MNE’s affiliate, which has become a leading firm in terms of process and organizational innovations.

“The company Alpha which has been working in our territory for many years, has adopted a business model based on assembly isles and there is a massive organizational innovation inside that firm. For instance, they aim as much as possible at having a natural light because the shoe has to be seen under natural, rather than artificial light. They have high sensitivity toward the safety of employees in the organization of the production process. Now, they are further investing in automatization and information systems.”

(Author’s translation based on the interview with a local consultancy)

Much more frequent than the inward FDIs, are the collaborations of local producers with external MNEs based on licensing and subcontracting agreements. In the first case, local firms are responsible for the production and distribution of the brand owned by the external MNE under payment of a royalty, while in the second case, local firms act only as producers. This is not a new phenomenon for the local IDs, as in the Nineties some famous luxury brands already addressed here the production of footwear, but the proliferation of local brands at the time limited the increase of firms working as subcontractors for larger

companies. Today, licensing agreements are less frequent than in the past, because the external MNEs have implemented their own retail network.

“Starting from the Nineties, many famous brands have relied on local producers for their shoe production (...) Those MNEs had not their own sales network, so they used to license their brands (...) to local producers which managed the distribution of the products. And those MNEs brought also new ideas about style. They said, «We want this type of shoe» and local producers agreed on modelling the product taking inspiration from the MNE (...) This phenomenon has much reduced because brands have now more structured sales and distribution networks.”

(Author’s translation based on the interview with a local consultancy)

Confirming the exchange of information within licensing agreements, the manager of one firm working as a licensee for diverse luxury brands, confirms that the purpose of these agreements is twofold: on one hand, increasing the cashflow in the short term, and on the other hand, acquiring new competencies related to emerging creative contents and to the sales and distribution networks.

More often, though, local firms work only as subcontractors for external MNEs. This has led to the rapid growth of local subcontracting firms, that have established large and well-structured organizations endowed with their own supply network. One of these firms has argued that they are really not interested in investing in their own brand, because this would require excessive resources to compete on the luxury segment with other well-known brands. In the end, the better strategy for them is continuing to work as producers, which is what they are specialized in and what they can do better than others.

In other cases, we see that subcontracting relationships enable information sharing about product style and fashion trends, but they do not enable further learning opportunities with regard to the organizational structure or to marketing and distribution channels.

“70% of our work goes for subcontracting activities (...) Making the sample shoes for them, we capture information on market trends. They ask for quality standards and for confidentiality agreements (...) but they are not really interested in the way production is organized. The most important thing is the quality of the final product.”

(Author’s translation based on the interview with a final firm)

The economic crisis of the last years has led also firms with their own brands to seal commercial agreements with external MNEs, raising much concern among local institutions on the subordination of local firms to the interests of the MNEs and on the incapacity to serve the market with their own products.

“We do not consider the increase of subcontracting activities (ndr, for external MNEs) as a positive factor, because being a subcontractor means to abandon the know-how, which is typical of the local footwear industry, to be on the market. The firm produces as long as it receives the orders, but whenever the orders stop to arrive, it misses the chance to be on the market because it has lost that know-how in the meanwhile (...) Famous luxury brands have come to our IDs because the quality of production has increased a lot in recent years. We have seen, for instance, firms which were specialized in the production of slippers and had poor organizational structures, have now grown and improved their organization working as a subcontractor for famous luxury brands. But it does not have the competencies to manage autonomously the market. Knowing how to make the product is fundamental, but also the ability to stay on the market, because otherwise you are at the mercy of circumstances.”

(Author’s translation based on the interview with a local institution)

The partial adaptation of local firms as subcontractors for external MNEs is what is enabling them to survive, and only a few leader firms have managed to stay on the market with their own brand without accepting to produce for others. However, the fact that local firms have maintained their own brand and are showing higher attention to the improvement of organizational structures, could signify that the necessity to work as subcontractors is a temporary solution to ensure an influx of revenues while the firm is investing in its market repositioning.

4.4. Effects of production internationalization on the cognitive configuration of the Macerata-Fermo IDs

In the last decades, the number of firms belonging to the footwear supply chain has significantly decreased due to the combination of unfavorable macroeconomic conditions – one above all the others, the commercial restrictions related to the Russian market – determining a contraction of the whole production core in the Macerata-Fermo IDs. However, a process of forgetting had started much earlier, though its perceived impact on

the systems was less severe, being circumscribed to certain specialized competencies.

In the early Nineties, local firms underwent a first phase of production delocalization regarding leather cutting and upper production, favored by the opening of Central and East European markets that were more competitive in terms of labor costs. This process continued unceasingly during the following decades, including also other countries, such as China and India. Today, these specialized competencies have dramatically reduced in the territory (Corriere Adriatico, 09/06/2017), preserving a scant group of workers specialized in these phases, who work mostly in the phase of prototyping inside the final firm, or as suppliers for the final firms that have kept production in the IDs: usually the less-structured, small final firms that do not have the financial and managerial resources to organize an international network of production, or the final firms that produce high-quality products for the luxury segment.

The heavy contraction of the cognitive core, and especially of the know-how nuclei related to leather cutting and upper production, raises concerns over the future development of the IDs. The respondents to the interviews have frequently underlined that the scarcity of specialized competencies is a limit for the “repopulation” of the footwear industry in the IDs.

“Due to the massive shift of manufacturing activities between the Eighties and the Nineties, people who are today 25, 30, 40 years old, have not the competencies to do upper production. In the past, you had a continuity instead. People who can do upper production today, are older than 50 because they were born in that culture. They started their job at 15 years, sometimes before completing the school. With delocalization (...) we have completely lost the manufacturing culture and those people who were 20 years old in the Nineties and 40 years old today, they cannot do upper production. We lost everything.”

(Author’s translation based on the interview with a local consultancy)

As revealed by the interview, not only has production delocalization impacted on the endowment of those specialized competencies related to the manufacturing activities moved abroad, but it has also contributed to worsen the perception the local society had about the work in the footwear industry with regard to its potential to ensure financial stability and social recognition (Blim and Goffi, 2014).

“Besides the outsourcing of leather cutting and upper production, we need to say that the loss of specialized competencies in footwear production derives also from other factors, primarily because making shoes has never been a reason for pride in this territory (...) The common thought was that young people working in the footwear industry were those who did not achieve good results at school. They were not able to go on with their studies, so they became workers in a shoe factory. (...) It is an extremely negative perception that has not valorized this job which today is gold.”
(Author’s translation based on the interview with a local consultancy)

Speaking to the supervisor of the course related to the footwear industry at the professional school, we have the confirmation of the negative reputation that the work in shoe manufacturing has across the families in the territory.

“In recent years, families’ common thought has been that the course on footwear manufacturing does not offer good career opportunities and they have increasingly dissuaded their son or daughter to study for a profession related to the footwear industry. They believe that the footwear industry does not offer opportunities of employment and professional realization. (...) Families have always seen the course on footwear manufacturing as something that prepares students to work in the assembly line, ignoring the many roles that the footwear firm necessitates, such as the “manufacturing engineer” or other intermediary roles, which require specialized competencies acquired through a specific course. We still have a lot to communicate from this point of view.”
(Author’s translation based on the interview with a local professional school)

In recent years, the local footwear industry has been experiencing important changes, primarily with regard to the target market (i.e. from medium-high quality to luxury shoes), to the organization of production activities and to the structure of local firms. Local firms are now competing on product quality and addressing their activity to the luxury segment characterized by higher profit margins. The increasing attention to quality control (rather than just to efficiency) downsizes the economic advantages that they used to have until some years ago by outsourcing labor-intensive production activities in low-cost countries, encouraging them to bring production back (Bailey and De Propriis, 2014). The “reshoring” of production activities is though undermined by the lack of specialized competencies, which is urging local firms and institutions to focus on the initiatives addressed to train the

new generations of skilled workers. In the past five years, some firms have committed themselves to improve skill building. In the Macerata-Fermo IDs, we have some remarkable examples of firms that have established in-house “academies” to provide a comprehensive training on production techniques and on organizational and managerial functions, usually with the support of other public or private institutions such as business associations or training agencies (Il Sole 24 Ore, 29/08/2017).

“In recent years, we are observing the return of many producers who are bringing manufacturing back to Italy with huge difficulties because they often do not find specialized workforce. But there are some special cases of firms that have created internal schools to train people. They do leather cutting, upper production and the rest of the manufacturing process.”

(Author’s translation based on the interview with a local consultancy)

In the last few years, local institutions have also been involved in the organization of training activities, although the institutional adaptation to this competence gap that had emerged, proceeds at a slower pace compared with IDs located in other Italian regions. Between 2010 and 2011 two events have impacted on the provision of education services within the institutional frame: one is the closure of the professional school specialized in the footwear industry due to the lack of new enrolled students; the other one is the introduction of two-year post-diploma courses on the fashion industry for people in their apprenticeship age (one dedicated to the improvement of marketing competencies, the other one to manufacturing activities). Specifically, the courses have been organized since 2010 by a local institution which has been promoted by a collective action involving professional and technical schools, business associations, public institutions, firms and Universities, and it belongs to a nationwide network of technical institutes specialized in post-diploma education²². According to the data of the Italian Ministry of Education published in 2017, more than a half of the students which had concluded one of the courses offered by the

²² The post-diploma course which we refer to, is managed by one of the institutions called “Istituto Tecnico Superiore” (ITS), which were established in different parts of Italy through a 2008 legislative decree, to train students on the use of new technologies for the development of Made in Italy industries. In the Macerata-Fermo IDs, the ITS Moda Calzature is specialized in improving manufacturing and organizational competencies related to the footwear industry. Several local institutions including business associations (e.g. Confindustria, CNA), governmental institutions (e.g. the provinces of Fermo and Macerata), schools (e.g. professional and technical schools), local Universities and firms, have collaborated to the organization of the courses.

Macerata-Fermo technical institute in 2015, have been employed within 12 months from the conclusion of the course (especially, those who attended the course in marketing and new strategies for internationalization) (INDIRE Report, 2017). The supervisor of the course dedicated to the footwear industry at the local professional school, confirms the satisfactory results in terms of participation and motivation of the students (around 20 at each course) and the employment opportunities, fueling positive expectations on the contribution of younger generations to the restructuring of the local footwear industry.

4.5. Learning opportunities from the participation of the Macerata-Fermo IDs into GVCs

If, on one side, there has been a forgetting process due to production internationalization, the involvement into GVCs offers IDs also learning opportunities in terms of expansion of existing know-how nuclei or spawning of new know-how nuclei. Focusing on the local footwear industry, the learning opportunities emerging from international openness translate primarily into an enrichment of skills and competencies inside the cognitive structure of know-how nuclei. Competencies acquired through exporting activity and through commercial agreements with external MNEs represent the main learning channels for local firms from their participation into GVCs.

Although the exporting activity potentially represents one kind of learning opportunity by increasing knowledge about distribution channels and foreign markets, the intermediation of independent agents, representatives and distributors (that is still the most frequent modality to export) filters the information that local firms can collect from their international experience. However, local firms are getting more conscious of their competence gap and are developing more adequate organizational structures in support of their internationalization strategy. The medium-sized firms (from 30 to 40 employees) that we interviewed, have recognized their difficulties to approach foreign markets, and have expressed their commitment to work for improving their commercial capabilities, for instance by implementing social media marketing activities or by hiring external managers with long experience in managing the sales network for firms in the footwear industry.

“The Russian market which has brought golden opportunities until some years ago, has been experiencing a sharp decline for the past 3 years, causing huge problems. Local firms had to adapt, develop new collections and new business models, and explore new

foreign markets (...) One kind of investment that all firms are now doing is on marketing and digitalization, because the real challenge now is to find new markets where these products of excellence can be promoted (...) We observe that second-generation firms (...) have a higher capacity to identify new target markets and to manage new marketing and distribution channels. They know how to be recognized through the web and through other digital channels. They understand the potentiality of improving an e-commerce platform and of bearing the investments behind it, which would be much more difficult in the old version of the footwear firm.”(ndr, in this regard see also Corriere della Sera, 21/11/2014)

(Author’s translation based on the interview with a local consultancy)

Learning opportunities for the IDs come also from external MNEs investing on their own affiliates in the territory, or establishing subcontracting relationships with local firms. Regarding the new knowledge that may derive from affiliates of MNEs, local KIBS firms (e.g. consultancy) act as a fundamental channel to transfer information across the firms of the IDs, having extensive knowledge about the local footwear industry and about the innovations adopted by affiliates, usually regarding the production process and the organizational structure. Indeed, the firms interviewed, have declared to have no direct relationships with the affiliates of external MNEs located in the territory.

More frequent and direct are the interactions between local firms and external MNEs based on subcontracting agreements. When asked if they are learning something from the external MNEs, for instance about organizational adaptation or the management of distribution channels, the answers of local firms are controversial. Some of them firmly believe that the external MNE takes the full advantage of the relation, as it benefits from the specialized know-how of the local producer. Others have undertaken organizational change with the support of the external MNE, which requires higher operative standards and quality control. In one case, the local firm has established a new subsidiary in the territory, which is co-owned with an external MNE, enabling a two-way learning process based on the exchange of specialized know-how related to production on one side, and of knowledge about organizational practices, marketing and distribution channels on the other side. A similar example of a joint venture realized between a local firm and an external famous brand has been described in the article published on Cronache Maceratesi (04/05/2017). In many cases, external MNEs have contributed to increase the know-how of local subcontractors about product style, being always on the frontier with regard to the analysis of fashion

trends. Furthermore, they brought into the territory more advanced organizational competencies and in exchange for that they could rely on the specialized know-how of local firms about the entire process of product manufacturing.

4.6. A development path based on sectoral continuity or sectoral shift? The path ahead of the IDs in the provinces of Macerata and Fermo

After analyzing how the participation into GVCs is affecting the stock of systemic knowledge inside the Macerata-Fermo IDs, we focus now on the main trajectories of development observed in the territory. To this end, we recall the conceptual framework introduced in the first two sections, and comment on the main findings about the recent evolution of the cognitive and institutional frames in the territory (Table 5).

In recent years, the production core related to the footwear industry has dramatically contracted in the IDs of Macerata and Fermo, determining a diffuse forgetting process of those competencies related to footwear manufacturing. Inside the same industry, we have seen that the surviving firms are getting more conscious about their organizational weaknesses, and are planning further investments to improve their competencies related to indirect functions, such as process management, marketing, and distribution activities. However, this process of change is still at its very beginning, as we observe that local firms still have on average poor organizational structures, despite being endowed with top-level competencies related to product manufacturing. The management of the firms is usually flat, especially in small and medium-sized firms, implying a high degree of centralization of decision-making processes in the hands of the entrepreneur²³. The traditional scarce division of powers and the limited capacity of strategic planning, has resulted in a range of bottlenecks for the development of the firms, such as the diffuse backwardness in those competencies related to the management of the internationalization process, digitalization, marketing and distribution activities.

Local institutions are adapting their initiatives to the recent needs of the sector, organizing seminars to inform firms about current global issues, and providing comprehensive training courses to attract the younger generations to the footwear industry. However, the relatively

²³ Firms are usually family-owned and run by the family's members with very limited access to external executives

late introduction of these collective actions compared with other Italian footwear IDs²⁴, and the difficulties to involve local firms into the above initiatives, do not allow to presently detect the expected positive outcomes at the aggregate level.

Confirming the view of Dini et al. (2015) on the strong individualism of the footwear firms in the Macerata-Fermo territory, local institutions denounce a scarce interest of local firms to establish business networks. However, the interviews with firms and other local actors reveal that supply relationships are still strong and stable along the same value chain, and in some cases, we see that footwear firms collaborate with firms belonging to different value chains for the achievement of common goals. For instance, we observe that firms from different sectors have participated as a group into the regional call to obtain incentives for shared innovative projects, and thus to benefit from the positive synergies in terms of learning opportunities emerging from the collaboration. With regard to a project presented for this regional call, a local consultancy affirms that:

“About the development of new materials there have been projects involving the entire supply chain, in which some firms have come together with producers of heels and soles, to realize new products with new fabrics, new paints, new manufacturing techniques, so the research on materials is certainly fundamental (...) and it involves also firms that are at the edge of the footwear supply chain. This aspect is very interesting because from the synergy between soles producers, upper producers and final firms, entirely renovated products could emerge.”

(Author’s translation based on the interview with a local consultancy)

Despite these common trends regarding the cognitive and institutional frames, a distinction has to be done about the observed trajectories of development inside the IDs of the Macerata province and those of the Fermo province.

The expansion of competencies regarding the production of rubber soles (footwear industry), and the spatial proximity to related know-how nuclei belonging to other industries (e.g. musical instruments, lighting, silver products), has improved a common knowledge base in the Macerata IDs referred to molding techniques, especially of plastic materials. The richer variety of manufacturing industries is opening the Macerata IDs to

²⁴ The current coordinated initiative to provide training courses in the footwear industry (i.e. the technical institute) has been activated in 2010, after years of increasing training gap due to the absence of effective collective actions

potential unlearning processes, as a combination of the loss of certain competencies related to footwear manufacturing and the expansion of competencies related to plastic molding, leading to the expansion of related business fields, not specifically referred to the footwear industry. Furthermore, information collected on the local firms specialized in molding activities, both for the footwear industry and for other industries, reveal that these firms have on average more advanced organizational structures, are more innovative, more open to collaborations (with other firms and also with local institutions) and more attentive to adapt their strategies to current global issues. Although the IDs of Macerata are still deeply involved in a process of forgetting due to the contraction of the production core related to the footwear industry, these signals may reveal an opportunity for undertaking a development path based on a sectoral shift, referred to the expansion of other business fields having a certain degree of cognitive relatedness with the footwear industry²⁵.

Diversely from the previous context, the province of Fermo is traditionally more concentrated on the footwear industry, as recognized by the institutional stakeholders during the interviews. The residual composition of the local economy is, in fact, characterized by the presence of micro-clusters (e.g. agrifood, hat production) and of some individual excellences (i.e. large, vertically integrated companies) in a range of different sectors (e.g. mechanical industry, jewelry). The present research has not detected significant interactions between the footwear industry and the rest of the economy, that may prelude to a collective trajectory of development towards complementary business fields. The loss of footwear manufacturing competencies is being replaced by the recent attempts of the footwear firms to introduce organizational innovations (e.g. expansion of competencies related to marketing and distribution activities), promoting a development path based on continuity with the main industry of specialization and the history of the place.

²⁵ In addition to the sectoral redistribution of the local economy within manufacturing industries, table 6 shows that the overall manufacturing employment in the province of Macerata is decreasing, while the employment in service sectors is increasing.

Table 5: Comments on the main findings of the field research.

Province	Evolution of the cognitive frame		Evolution of the institutional frame		Endogenous cognitive process
	Footwear industry	Other industries	Business relationships	Collective actions	
Effects in the sole province of Macerata	<ul style="list-style-type: none"> Expansion of competencies related to product sole production (particularly the molding of rubber soles) 	<ul style="list-style-type: none"> Expansion of competencies related to plastic molding, thanks to the presence of micro-clusters in the province having a certain degree of knowledge relatedness 		<ul style="list-style-type: none"> Firms of all industries are more sensitive to the initiatives of local institutions aimed at informing on current issues, e.g. digitalization, internationalization 	<ul style="list-style-type: none"> Learning of competencies related to plastic molding
Effects in the provinces of Macerata and Fermo	<ul style="list-style-type: none"> Loss of competencies related to product manufacturing (especially leather cutting and upper production) Expansion of competencies related to process management, marketing and distribution activities 	<ul style="list-style-type: none"> Expansion of competencies related to service industries and also to some specific knowledge-intensive services (e.g. consultancy) 	<ul style="list-style-type: none"> Stable supply relationships among the firms of the footwear industry Extra-local expansion of firms' supply and sales relationships (even among intermediary firms) Scarce capacity to establish local collaborations among firms with homogeneous know-how (however, some examples of collaborations among firms belonging to different and complementary business fields) 	<ul style="list-style-type: none"> Improvement of training courses for the footwear industry (concerning both product manufacturing and marketing/distribution activities) Improvement of informative activities by local public and private institutions on current issues, e.g. digitalization, internationalization, Industry 4.0 	<ul style="list-style-type: none"> Forgetting of competencies related to footwear manufacturing Learning of competencies related to service activities, e.g. marketing, distribution
Effects in the sole province of Fermo		<ul style="list-style-type: none"> The province is endowed with "individual excellences" (i.e. large, vertically integrated companies) which are not embedded into extensive local networks and thus have not contributed to generate external economies of learning Other micro-clusters are present in the province (e.g. agrifood, hat production) but we do not detect significant innovation and development in these sectors 		<ul style="list-style-type: none"> Scarce participation of local firms into the activities organized by local institutions to inform about current issues, e.g. digitalization and internationalization 	<ul style="list-style-type: none"> Learning or forgetting processes outside of those mentioned above about the main core of specialization, have not been detected

Note: The table summarizes the findings from the field research. Further changes that may be happening but that have not been detected, are not included. The period which the above findings refer to, is defined by the information collected through desk research and interviews, approximately corresponding to the time-span between the first delocalization strategies (early Nineties) until the moment in which this research has been done.

Table 6: Average variation of the number of employees between 2012 and 2015 by ATECO 2007 sections and by province. Source: Author's elaboration based on ISTAT data.

Industry	Macerata	Fermo
B: Mineral industries	-24,19%	6,60%
C: Manufacturing industries	-3,45%	-2,44%
D: Electricity and gas supply	8,13%	-6,07%
E: Water supply	8,49%	0,95%
F: Constructions	-5,93%	-5,61%
G: Wholesale and retail trade, repair of motor vehicles and motorcycles	-1,71%	-2,37%
H: Transports	-0,16%	-4,28%
I: Accommodation and food services	-3,66%	-3,64%
J: Information and Communication Services	1,86%	1,03%
K: Financial and Insurance Services	2,40%	-1,19%
L: Real estate services	1,56%	5,01%
M: Professional, scientific, and technical services	-1,89%	0,36%
N: Rental services, travel agencies, business support services	6,58%	2,63%
P: Education	4,58%	-9,77%
Q: Health services and Social assistance	2,33%	3,43%
R: Artistic, sport, and entertainment activities	-1,97%	-5,78%
S: Other services	0,09%	-0,30%

5. Conclusions

This Chapter has analyzed how the international openness of the Macerata-Fermo IDs is affecting the endowment of specialized competencies in the territory, triggering endogenous cognitive processes that modify the cognitive frame of the system. The exploration of the endogenous cognitive processes sheds light on the implications of the internationalization dynamics for the expansion and contraction of the specialized competencies related to certain business fields, and thus it is key to define the development path that the system could potentially undertake.

To understand how international openness affects the cognitive frames of IDs and, ultimately, their development path, we focus on the recent evolution of the footwear IDs located in the provinces of Macerata and Fermo (Italy). Based on the information collected from the interviews with local actors (firms, institutions, firms specialized in KIBS) and from desk research activities (analysis of institutional reports, articles from newspapers, company websites, and so on), we have analyzed the main internationalization strategies undertaken by local firms and the implications for the development of the IDs in the two provinces. The most common type of internationalization strategy pursued by local firms,

concerns the exporting activity, usually intermediated by agents, representatives and distributors who limit the opportunities of learning-by-exporting for the firm. With regard to production internationalization, we observe that starting from the Nineties the Macerata-Fermo IDs have been involved into a massive expansion of delocalization strategies, especially through offshore outsourcing, determining a diffused loss of manufacturing competences related to leather cutting and upper production. This phenomenon is recently showing a reverse pattern, as some firms are bringing back production activities to sustain the production of lower volumes of luxury products and to ensure a closer control of product quality. In recent years, the downward trend of the exporting performance and the global competitive pressures have forced local firms to establish subcontracting and licensing agreements with external MNEs, which ensure short-term cash-flow, and in some cases, they contribute to absorb advanced organizational competences from the same MNEs.

At the time of the present research, we can argue that the main transformation of the cognitive frame in the Macerata-Fermo IDs emerge from a diffused process of forgetting regarding the entire production core of the footwear industry and especially some specialized competencies related to product manufacturing (e.g. leather cutting and upper production). As we have seen above, this is due, at least in part, to the reconfiguration of the production structure following the high numbers of plant closures in the recent years and the strategies of production delocalization undertaken by local firms. However, we argue that behind this impoverishment of the footwear industry, there are also explanations from the cultural background of the place. The institutional respondents to our interviews confirm that for decades (especially from the Eighties, when the job in the footwear industry had lost its image of ensuring economic wellbeing and improving social status) young people diverted their professional choices from the footwear industry reflecting the common consideration of the job as a residual choice for those who were not enough capable at school. This stereotype prevented families from encouraging their children to pursue a career as blue-collars in the industry, leading to the closure of the only professional school in the territory specialized in the footwear industry and thus impeding the intergenerational change within the industry. Recent efforts by local firms and institutions aim at counteracting this trend of “brain drain” from the footwear industry, focusing on the organization of training courses to attract young people to the different jobs, related to production and not, within the footwear value chain.

Despite the challenges that the footwear industry is currently facing, we observe some positive signs from local firms, which are getting more conscious about the necessity to undertake consistent organizational innovations (especially with regard to management structures, marketing and distribution activities), remedying to the well-known structural constraints characterizing the local footwear firms.

Concerning the province of Macerata, we observe that the main innovators of the footwear value chain correspond to the producers of components, especially rubber soles and heels. This is supported by the spatial proximity with other business fields sharing a certain degree of cognitive relatedness with regard to plastic molding. Differently from the IDs of Fermo, where the footwear industry is showing a development path based on sectoral continuity supported by a process of unlearning within the cognitive core, the signals from the IDs of Macerata are hinting at a process of unlearning towards related sectors, sustaining a gradual shift from the footwear specialization.

Acknowledgments

I wish to warmly thank Francesca Spigarelli for her support and advise during the field research, and for giving me the chance to collect valuable contributions during a research meeting for PhD students with Peter Buckley at the University of Macerata in May 2017. I would like also to thank the people interviewed, who were all so generous to spend their time with me and eager to share their knowledge.

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Conclusions

In the last three decades, we have observed a profound transformation in the organization of the production process, characterized by the fragmentation of activities into separable blocks which could be more easily transferred on a global scale to reap the benefits from each country's comparative advantage. Following the wake of globalization and technological advancement, firms have more and more relied on their international reach to tackle the tougher global competition, as internationalization strategies could enable them to increase efficiency of production activities, explore new markets, and access resources that were not available at home. This trend has led scholars to focus on concepts like global value chains (GVCs), global production networks (GPNs), global innovation networks (GINs), which emphasize that the firm's competitive advantage is highly influenced by their ability to overcome the national borders and access a global network of cost advantages, market opportunities and knowledge resources.

After the general excitement about internationalization as the key ingredient to renovate the competitive advantage of firms in industrialized countries, we now take stock of the consequences of internationalization, and specifically we observe whether this cross-country reshuffling of economic activities has exacerbated a declining trend, or whether it has triggered new trajectories of development in advanced economies. As expressed throughout the thesis, we propose to analyze the transformations of the economic systems, by considering the adjustments in the endowment of specialized competencies through learning and forgetting processes, representing the starting point to build up new paths of development.

Based on the considerations above, this research has presented a critical analysis of internationalization in terms of the opportunities (and threats) they can offer for domestic economies in industrialized countries. To do this, we have shifted our attention from the micro-level strategies (i.e. firms) to the meso-level effects of international openness, looking at the implications for socio-economic systems characterized by the presence of localized industries, such as IDs. The idea is that the consequences of internationalization are not just visible on those firms moving their activities abroad, but also on the surrounding population of firms by means of cascading effects on network ties and system-wide external economies. Therefore, the measurement of the effects of internationalization requires a double level of analysis: one related to the firm-level consequences (e.g. expansion of

leader firms), the other one concerning the systemic effects (e.g. expansion or contraction of certain industries) affecting the emergence of external economies. The ID represents a privileged environment to observe how internationalization generates these systemic effects that may support or constrain the future development of the system.

The First Chapter has defined the endogenous cognitive processes in IDs as the result of external economies affecting the stock of systemic knowledge through increasing variations (i.e. learning effects) and decreasing variations (i.e. forgetting effects). The combination of learning and forgetting effects, resulting into a process of unlearning, corresponds to the transformation of the cognitive structure characterized by the expansion of certain industries and the contraction of others, which may also hint at a new trajectory of development for the system. The conceptual frame has described how the ID structural conditions (e.g. the industrial configuration, the network structure, the processes enacted to generate knowledge external economies) enable the system to explore internal and external knowledge inputs, triggering those endogenous cognitive processes that determine the accumulation or depletion of systemic knowledge. On this basis, we have discussed how an external shock (i.e. external to the local cognitive process), such as the establishment of international relations between system's actors and external actors, may affect the process of knowledge accumulation in the system. In this regard, we have distinguished between two types of internationalization strategies. The first one refers to knowledge seeking strategies contributing to access new knowledge inputs on foreign markets, while the second one describes knowledge exploiting strategies having the purpose to exploit the firm's knowledge on foreign markets with complementary or substitutive effects for domestic firms. Depending on the system's absorptive capacity and on the degree of participation of the firm into local business networks, inward knowledge exploiting strategies and outward knowledge seeking strategies contribute to bring new knowledge inputs and to trigger learning processes throughout the system. However, inward and outward internationalization may also lead to the impoverishment of the system's industrial base and thus of the endowment of specialized know-how, determining the depletion of systemic knowledge through forgetting processes. For instance, this may happen when the technological knowledge of the incoming firms is not shared throughout the system, either due to the system's low absorptive capacity or to poor networking relations, increasing the risk of replacement of domestic activity with foreign activity. A partial or integral loss of specializations in the ID may be also due to outward internationalization strategies, whereby ID firms exploit their knowledge on foreign markets moving abroad activities that

were previously embedded in the ID.

The Second and Third Chapters provide empirical evidence to the concepts introduced beforehand. The econometric analysis presented in the Second Chapter had the purpose to measure the effects of the system's degree of internationalization on the innovation strategies of ID firms. This is based on the idea that the two types of internationalization strategies undertaken by ID firms (i.e. outward internationalization), namely knowledge seeking and knowledge exploiting strategies, impact on the system's cognitive configuration triggering learning and forgetting processes. The expansion (contraction) of systemic knowledge, resulting from learning (forgetting) processes, may support (constrain) the emergence of knowledge external economies, affecting the innovative performance of ID firms. After classifying the strategies of knowledge seeking and knowledge exploiting internationalization, the methodology has consisted of a two-step procedure. First, we have clustered Italian ID firms by their innovation mode using data from the MET survey 2015. Then, we have tested through a multinomial logit whether the probability of an ID firm to belong to one of the four clusters, depends on the amount and type of internationalization overall undertaken by the firms in the same territory where the ID firm is located. The empirical analysis has highlighted the relation between the type of internationalization pursued by the firms in the region and the innovation strategies of the ID firms located in the same area. Specifically, knowledge seeking internationalization increases the probability of an ID firm to become a Complete Innovator over time. Conversely, knowledge exploiting internationalization is related with two different patterns of innovation. In the first place, it encourages firms to accumulate competences in process management, increasing the probability of becoming a Process Innovator. On the other hand, it decreases the probability of becoming a Complete Innovator, highlighting potentially weakened DIC-based learning processes due to a substitution effect with local business networks.

In the Third Chapter, we have analyzed how the international openness of IDs may contribute to modify the knowledge endowment of the ID through the endogenous cognitive processes described in the First Chapter, determining the development path undertaken by the system. Internationalization changes, in fact, the sectoral composition of the ID, favoring the expansion or contraction of certain industries and of their specialized know-how. The increasing or decreasing variation of systemic knowledge as a consequence of learning and forgetting processes affects the emergence of knowledge external economies and thus the future accumulation of systemic knowledge, feeding a trajectory of

development that is tendentially path-dependent. We have applied these concepts to the case of the Macerata-Fermo footwear IDs located in the Marche region, Italy. The case study has confirmed both learning and forgetting effects from international openness. The first ones arise from the competencies gained through the involvement of ID firms into international sales network (i.e. exporting activity) and through the collaborations of ID firms with external MNEs. The second ones are generated by those internationalization strategies, primarily production delocalization through offshore subcontracting activities, that have determined the loss of certain specialized know-how in the local systems (e.g. leather cutting and upper production). Considering the development paths that internationalization may have contributed to in the Macerata-Fermo IDs, we observe that while the Fermo IDs seem to be more characterized by unlearning processes concentrated within the cognitive core, the Macerata footwear IDs seem to be more prone to adjust the local production organization by triggering diagonal synergies across different sectors, for instance between the production of rubber soles and heels and other local industries specialized in plastic molding. The degree of industrial diversification within the Macerata-Fermo IDs is thus key to define their paths of development, favoring unlearning processes towards other industries in response to structural shocks.

The thesis has contributed to the existing research on the transformations of IDs in two directions. First, it has defined the ongoing transformations as the result of endogenous cognitive processes (First Chapter), representing system-level dynamics that affect the performance of ID firms at the micro-level (Second Chapter) and the system's future trajectories of development (Third Chapter). Second, it has emphasized the necessity to consider the knowledge content of internationalization strategies as this may determine heterogeneous effects on the domestic market.

Nevertheless, this research is just a starting point for the debate about the effects of internationalization on IDs, leaving some fundamental questions still open. The first limit regards the identification of knowledge types which could help us understand the mechanisms of learning and forgetting. Does the system learn and forget all types of knowledge in the same way? While we find some contributions on the types of knowledge and the learning processes supporting their accumulation in IDs (e.g. the distinction of learning-by-doing, learning by-using, and learning by-interacting, see Bellandi, 1992), the issue about forgetting processes is still unexplored. The second limit concerns the methodology to analyze the endogenous cognitive processes in IDs. As discussed in the Second Chapter, the measurement of system-level effects (e.g. the variables concerning

internationalization) required the adoption of a regional-level perspective, assuming that the dynamics observed at this geographical scale have an impact on the ID firms located in the same territory. Compatibly with data constraints, the analysis would benefit from the availability of longitudinal data on a more detailed geographical scale. This would enable to measure the effects of learning and forgetting processes over time and on a unit of analysis that is more appropriate to capture the ID dynamics. A longitudinal perspective would be informative also for the case study analysis. The information collected on the Macerata-Fermo IDs could pave the way to follow-ups, having the purpose to compare the trajectories of development observed in this research with the future evolutionary trends undertaken by the same systems.

The above suggestions to improve this research would be helpful to explore diverse burning topics crossing different streams of literature. In the first place, we would contribute to the literature focusing on knowledge systems in two directions. On one side, we would focus our efforts on the identification of knowledge types affecting the cognitive process which the local system is up to (Grillitsch et al. (2016), Parrilli and Heras (2016)). On the other side, we could achieve a deeper understanding of local systems' evolutionary paths depending on the composition and transformation of the stock of systemic knowledge (see for instance Lazzeretti et al. (2010) for recent empirical evidence on related variety, and Menzel and Fornahl (2010) for the analysis of the cluster life cycle based on knowledge heterogeneity). Furthermore, this research has raised the attention on another issue which is at the heart of contemporary academic debates. This is related to the contribution of international networks for the transfer of knowledge inputs, and the impact that this may have on home economies and particularly on the innovation of domestic firms (Castellani et al., 2015). As stated in this research, the identification of internationalization strategies by their knowledge content would cut through the fog of the heterogeneous impacts of internationalization on the endowment of innovation capabilities in home economies, calling upon further empirical evidence on this issue. The transformation of business models due to the diffusion of advanced manufacturing techniques is making the topic even more relevant today, urging a restyling of the traditional view about the firm's decision between "vertical integration and geographical dispersion" (Mudambi, 2008: 701), and about the gains which could be achieved from internationalization.

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Appendix A (Second Chapter): Descriptive Statistics

Descriptive Statistics

Table 11: Mean estimation of firm size, age and years of experience in R&D between 2011 and 2015. Source: 2015 MET survey (ID firms sample).

Variable	Obs	Mean	Std. Dev.	Min	Max
Size	2352	48,94	113,22	0,25	2100
Age	2352	29,75	24,86	0	615
Experience in RD_1115	2352	1,00	1,61	0	4

Table 12: Distribution of ID firms by region and industry. Source: 2015 MET survey (ID firms sample).

		Industry												Total
		OTHER MANUF. INDUSTRIES	OTHER BUSINESS SERVICES	PAPER AND PRESS	TRANSPORT MANUFACTURING	GARMENT	FOOD	PLASTIC AND CHEMICAL	FURNITURE	ELECTRICAL MACHINES	MECHANIC	METALS	TRANSPORTS, POST AND COMMUNICATION	
Region	Abruzzo	5	9	1	1	11	7	4	1	3	2	9	4	57
	Campania	3	2	2	2	7	7	2	4	2	0	5	4	40
	Emilia Romagna	7	32	10	12	12	19	12	8	17	17	25	10	181
	Friuli Venezia Giulia	1	2	0	0	0	2	2	6	0	1	1	1	16
	Lazio	2	0	1	0	0	3	1	4	0	0	8	0	19
	Liguria	0	0	0	0	0	0	0	0	0	1	0	1	2
	Lombardy	25	63	18	10	41	27	50	36	37	61	63	34	465
	Marche	17	22	9	7	35	9	19	26	20	24	22	18	228
	Piedmont	16	14	3	7	6	4	11	6	4	20	13	6	110
	Puglia	2	14	9	2	20	9	4	8	2	9	16	11	106
	Sardinia	0	2	0	0	0	3	1	2	0	1	2	0	11
	Tuscany	34	69	21	11	103	21	33	33	16	36	30	25	432
	Trentino Alto Adige	1	0	1	0	1	3	1	0	0	1	4	3	15
	Umbria	4	4	1	1	2	3	1	0	0	0	1	2	19
	Veneto	42	83	30	30	54	29	54	60	63	84	78	44	651
Total		159	316	106	83	292	146	195	194	164	257	277	163	2352

Table 13: Distribution of ID firms by innovation activity in 2014-2015 and industry. Source: 2015 MET survey (ID firms sample).

		Innovation_1415*		Total
		No	Yes	
Industry	OTHER MANUF. INDUSTRIES	94	65	159
		59,12%	40,88%	
	OTHER BUSINESS SERVICES	213	103	316
		67,41%	32,59%	
	PAPER AND PRESS	62	44	106
		58,49%	41,51%	
	TRANSPORT MANUFACTURING	37	46	83
		44,58%	55,42%	
	GARMENT	180	112	292
		61,64%	38,36%	
	FOOD	74	72	146
		50,68%	49,32%	
	PLASTIC AND CHEMICAL	73	122	195
		37,44%	62,56%	
	FURNITURE	111	83	194
		57,22%	42,78%	
	ELECTRICAL MACHINES	70	94	164
		42,68%	57,32%	
	MECHANIC	109	148	257
		42,41%	57,59%	
	METALS	143	134	277
		51,62%	48,38%	
	TRANSPORTS, POST AND COMMUNICATION	120	43	163
		73,62%	26,38%	
	Total	1286	1066	2352

Note: % are calculated by row.

* Innovation is equal to “No” if firms declare to have introduced no innovations between 2014 and 2015, “Yes” if firms declare to have introduced at least one innovation (product, process, or organizational) between 2014 and 2015.

Cluster Analysis

Table 14: Mean of Size by innovation strategy (identified through cluster analysis). Source: 2015 MET survey (ID firms sample).

Over	Mean (Size)	Std. Err.	[95% Conf. Interval]	
Innovation Strategy				
Not-Innovators	34,11	2,47	29,28	38,95
Process Innovators	59,09	7,54	44,31	73,87
Product Innovators	60,20	4,80	50,79	69,62
Complete Innovators	94,44	10,18	74,49	114,39

Table 15: Distribution of ID firms by cluster and industry. Source: 2015 MET survey (ID firms sample).

		Cluster								Total
		Not-Innovators		Process Innovators		Product Innovators		Complete Innovators		
Industry	OTHER MANUF. INDUSTRIES	103	64,78%	18	11,32%	27	16,98%	11	6,92%	159
	OTHER BUSINESS SERVICES	242	76,58%	18	5,70%	28	8,86%	28	8,86%	316
	PAPER AND PRESS	65	61,32%	14	13,21%	14	13,21%	13	12,26%	106
	TRANSPORT MANUFACTURING	41	49,40%	11	13,25%	14	16,87%	17	20,48%	83
	GARMENT	192	65,75%	21	7,19%	47	16,10%	32	10,96%	292
	FOOD	78	53,42%	7	4,79%	32	21,92%	29	19,86%	146
	PLASTIC AND CHEMICAL	87	44,62%	17	8,72%	49	25,13%	42	21,54%	195
	FURNITURE	125	64,43%	11	5,67%	36	18,56%	22	11,34%	194
	ELECTRICAL MACHINES	73	44,51%	11	6,71%	36	21,95%	44	26,83%	164
	MECHANIC	126	49,03%	17	6,61%	65	25,29%	49	19,07%	257
	METALS	155	55,96%	39	14,08%	53	19,13%	30	10,83%	277
	TRANSPORTS, POST AND COMMUNICATION	144	88,34%	5	3,07%	8	4,91%	6	3,68%	163
	Total	1431	60,84%	189	8,04%	409	17,39%	323	13,73%	2352

Note: % are calculated by row.

Table 16: Distribution of ID firms by cluster and industry. Source: 2015 MET survey (ID firms sample).

		Cluster								
		Not-Innovators		Process Innovators		Product Innovators		Complete Innovators		Total
Industry	OTHER MANUF. INDUSTRIES	103	7,20%	18	9,52%	27	6,60%	11	3,41%	159
	OTHER BUSINESS SERVICES	242	16,91%	18	9,52%	28	6,85%	28	8,67%	316
	PAPER AND PRESS	65	4,54%	14	7,41%	14	3,42%	13	4,02%	106
	TRANSPORT MANUFACTURING	41	2,87%	11	5,82%	14	3,42%	17	5,26%	83
	GARMENT	192	13,42%	21	11,11%	47	11,49%	32	9,91%	292
	FOOD	78	5,45%	7	3,70%	32	7,82%	29	8,98%	146
	PLASTIC AND CHEMICAL	87	6,08%	17	8,99%	49	11,98%	42	13,00%	195
	FURNITURE	125	8,74%	11	5,82%	36	8,80%	22	6,81%	194
	ELECTRICAL MACHINES	73	5,10%	11	5,82%	36	8,80%	44	13,62%	164
	MECHANIC	126	8,81%	17	8,99%	65	15,89%	49	15,17%	257
	METALS	155	10,83%	39	20,63%	53	12,96%	30	9,29%	277
	TRANSPORTS, POST AND COMMUNICATION	144	10,06%	5	2,65%	8	1,96%	6	1,86%	163
	Total	1431	100,00%	189	100,00%	409	100,00%	323	100,00%	2352

Note: % are calculated by column.

Appendix B (Third Chapter): Text Analysis based on Interview Transcripts

Figure 4: World cloud based on the interviews with firms. Author's elaboration using the NVivo software.



Figure 5: Word cloud based on the interviews with institutions. Author's elaboration using the NVivo software.



Acknowledgments

I wish to write this note of thanks to the people who have supported me during the last three years, contributing in different ways to the maturation of the thoughts expressed in this work.

I would like to express my deepest gratitude to Professor Marco Bellandi, who has supervised the realization of this dissertation. With the wisdom and dedication of a master, he has modeled my skills and competencies to do research, guiding me to develop critical thinking and to turn my ideas into some valuable (and understandable by everyone) contributions. Remembering the hard times I have had during the last three years, I will always take as an example his exceptional ability to understand my moments of discouragement and to transform them into an opportunity to think about my work and find again the right path. I am infinitely grateful to him for showing the greatest respect for my times and my thoughts, even when they are so chaotic and rambling.

The turning point of my PhD experience has come during the MAKERS Summer School at the University of Birmingham in 2016, which Professor Bellandi and Professor Lisa De Propriis had invited me to attend. I call it a turning point because it was in that occasion that my research took a clear direction, benefiting from the many stimulating conversations which I enjoyed in those days with the participants to the conference. In addition to defining the main focus of my research, I had the chance to meet Professor Lisa De Propriis, with whom I could collaborate later on as a visiting PhD student. The time spent with Professor De Propriis at the University of Birmingham has been a real blessing for the evolution of my research and for my first attempts to put my ideas “pen to paper”. I wish to thank Professor De Propriis for supporting me in this phase and for joining me in brilliant conversations about the topics contained in this work.

I would like to thank also Professor Luciana Lazzeretti, Academic Director of this PhD course, for showing the highest dedication to the training of young researchers, like me. I would like to express her my sincere esteem for teaching me the privilege and the value of doing this job, encouraging me to believe in the contribution that I can give for the progress of our society.

Some special thanks go to all those people who have contributed, with their advice and suggestions, to build up step-by-step this research, particularly Professor Luca De Benedictis and the Professors from the PhD committee. I am indebted to the researchers

from the MET – Monitoraggio, Economia e Territorio research center in Rome, in particular to Raffaele Brancati, Emanuele Brancati, Andrea Maresca and Manuel Romagnoli, and also to Professor Francesca Spigarelli, for their invaluable support in the development of the empirical analyses.

I would have never been able to overcome my insecurities without the precious help of Erica Santini. I would like to thank her for the time spent together to share ideas on our common research interests, and for her endless willingness to discuss with me the various parts of this work.

I am happy to have gone through this journey with the other PhD students, particularly Stefania, Patrizia, and Valentina. I am grateful for the bond we have immediately built, starting from the moments spent together at the canteen of the University of Trento. I wish to thank them for having remained always so close to me, both professionally and emotionally, despite the distance.

I would like to thank the people who have always encouraged me to do my utmost, making me understand the value of accepting sacrifice to achieve the greatest satisfactions, my parents, who have unconditionally believed in me and supported me, even when they did not really understand what I was doing and why I was doing that.

To Paolo, my husband, who has supported me from the very first moment I decided to embark on this journey. Thank you for showing me the greatest respect for my inclinations, even when they have led us to difficult choices. Thank you for teaching me every day that the person comes before the researcher, and that being a good researcher is not disjoint from being first an altruistic, careful and respectful human being. I am grateful for having you at my side in this life full of surprises. I hope we will always keep dancing together over the new adventures we will encounter along our way.